ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

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Customers' Complaints

Protecting Great Britain's Reputation

BRITISH manufacturers as a whole fully realize that in the present abnormal state of world affairs it is possible to sell almost anything which countries badly need. But those of them who wish to stay in the export business are well aware that what they do now will have a considerable influence upon their future trading. They know that in the long run British goods will only be acceptable if they are of the best quality. It is unfortunately true that costs in this country are high and that competitors with lower standards of living will eventually be able to undercut British exporters. For this reason novelty, ingenuity, sound construction and consistent performance must ever be our aim.

Export of Inferior Goods

As we have said, all this is realized by the "long-term" exporters, particularly the electrical manufacturers, but unfortunately there are to-day a number of concerns whose sole aim is to snatch a quick profit from the sale of inferior goods while conditions are as they are. The home consumer has suffered from these "jerry-building" concerns and that is bad enough. But what is infinitely worse is the effect upon our good name in overseas markets—even the most friendly of them.

The Government is troubled by these people and more than once Sir Stafford Cripps, upon whom the responsibility for exports rests, has referred to their injurious practices and has called for reform. Our reputable manufacturers are just as eager to see them either reformed or rooted out, for they are the sufferers immediately and in the long run from this unscrupulous competition.

How is it possible to eliminate these "export pirates" if they persist in their evil courses? It has been hinted officially that any flagrant cases of the sale of inferior products in overseas markets might lead to the cutting-off of the supply of materials to the delinquent concerns. Experience has shown, however, that material is frequently diverted from its legitimate purposes into other channels and without an inordinate amount of surveillance it is not easy to guard against this. We would not for a moment suggest a system of export inspection, even if sufficient inspectors with the requisite knowledge could be found, for that would constitute a dreadful handicap to overseas trade.

Lines of Action

It seems to us that the remedy can only be applied after a certain amount of harm has been done but prompt action might then mitigate that harm. We suggest that it should be made known in all overseas markets that the British Government is anxious to protect the country's reputation and that any instances of the sale of shoddy products should be reported to the local commercial diplomatic officer for investigation. That officer could then report to the Board of Trade (through the Export Trade Development Department) which should at once take steps to curb the defaulters' activities.

This would help to allay the apprehensions of many of our overseas friends who

are dismayed at the effect which the activities of a few unmoral and dishonest exporters are having upon our reputation for fair dealing and sound workmanship.

Export Handicaps

A CORRESPONDENT in this issue suggests that in our leading article of October 31st we ignored the difficulties encountered by exporters in the way of import restrictions. We are well acquainted with the handicaps which particular firms find in certain markets and do not belittle them. At the same time, viewing the position broadly, these restrictions are not often absolute and insuperable. In the first place, many countries, Empire and foreign, have not imposed them. Secondly, where restrictions are in force they frequently do not apply to most types of electrical equipment, which most countries are anxious to acquire. Indeed, speaking generally, electrical exporters are favourably placed in comparison with others and the September Board of Trade returns certainly indicated that the trade was still advancing.

High-Power Testing

ALTHOUGH in almost any electrical or indirectly electrical field the Nelson Laboratories described in this issue add materially to the British research capacity, both long- and short-range, they have a more obviously practical value that is of immediate importance to export activities. The high-power laboratory is a notable addition to the number of high-voltage testing stations, which enable foreign purchasers to be certain that equipment produced here has been proved by tests that closely simulate the most severe conditions likely to obtain on the largest electrical systems anywhere in the world.

Economics and Realities

WE are not surprised that a recent article in the *Economist* on the electric power plant position has been taken more seriously than similar statements in other papers. What we are concerned about is that our contemporary really appears to believe what it says when it contends that the advance in electricity consumption cannot go on and therefore much of the plant now planned (even with what is termed "trimming here and there") will be redundant. The *Economist* thinks that electricity is too cheap and some form of surcharge should be imposed upon consumption over basic allowances. What appear to be very sound arguments are put forward to justify this course but they rest upon the insecure hypothesis that the present high load factor will not be maintained and that more and cheaper coal will entirely alter the situation in the future. It was such reasoning as this which got us into the present mess. The *Economist* says that no argument has yet been advanced that a purchase tax on electricity is administratively unworkable. Administrators can do anything nowadays (by the engagement of sufficient staff) reasonable or not. They operate on the "economic man" who is very different from the ordinary human being.

I.M.E.A. Proposals

WE have not received a copy of the memorandum circulated to its members by the I.M.E.A. in advance of the extra-ordinary general meeting to consider the future of the Association, but we are told that it is merely a statement of facts. No lead is given to the members, who are expected to put forward their ideas on the subject. We consider that in a matter of this kind much assistance can be given by previous publicity so that members will go to the meeting with some knowledge of what other members think, instead of putting forward independent undigested schemes. In this issue we mention the first plan we have seen, that of the Committee of Smaller Municipal Electricity Supply Undertakings. We hope that others will express their views.

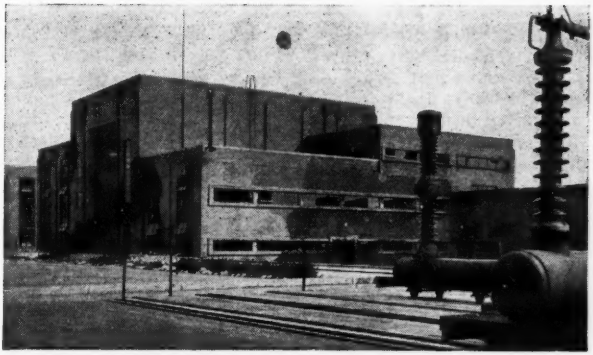
The Southern Railway

THE world's greatest suburban electric railway established a principle of cardinal importance when it decided after the amalgamations of the early 'twenties, which constituted the Southern Railway, to extend its electrified system. Schemes were judged, Mr. C. M. Cock stated in his I.E.E. paper last week, not so much on estimated savings in operation as on increased revenue expected from the provision of faster, more frequent and cleaner services. The successful results of this application of principle are now history. Although the future may offer less promise of further financial improvements, scope is still afforded to technical advance that will enhance the international prestige of this electrification.

High-Voltage Research

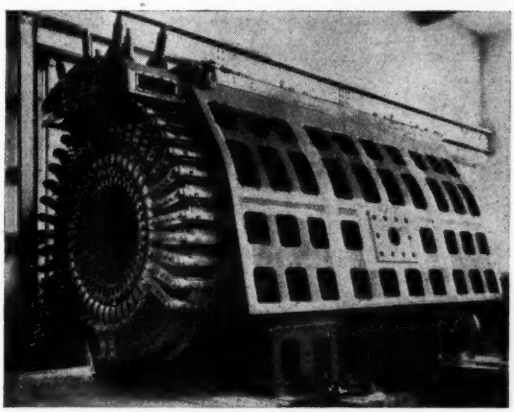
New English Electric Laboratories

THE Nelson Laboratories at Stafford, which were opened on November 5th by the President of the Board of Trade (Mr. Harold Wilson), are in two main groups. One, covering four acres adjoining the works of the English Electric Co., provides a floor area of 70,000 sq ft, the buildings for which were put in hand during the inter-war slump. The high-voltage section and the first stage of the high-power section were completed in 1938, and in 1939 chemistry, insulation, general and vacuum physics, electrical and electronics sections were added. During the war a metallurgical section brought the total number to ten.



High-voltage laboratory and control room

A project to increase the short-circuit power available in the high-power laboratory was held up until 1945. It now comprises two installations, including 60,000-kVA alternators which, when operated in parallel, can produce instantaneous short-circuits of 2½ million kVA at any standard voltage from 11 to 264 kV. Tests are carried out on circuit breakers, fuses and transformers, and provision is made to investigate all consequences of electrical faults on plant of all kinds. Fundamental research is also undertaken on the conduction of electricity in gases and the factors that influence deionization in gases and in vacuum. At the time of our recent visit to the laboratories typical activities were the measurement of the recovery voltage characteristics of a circuit breaker under voltage without short-circuiting the network, and of recovery voltage.

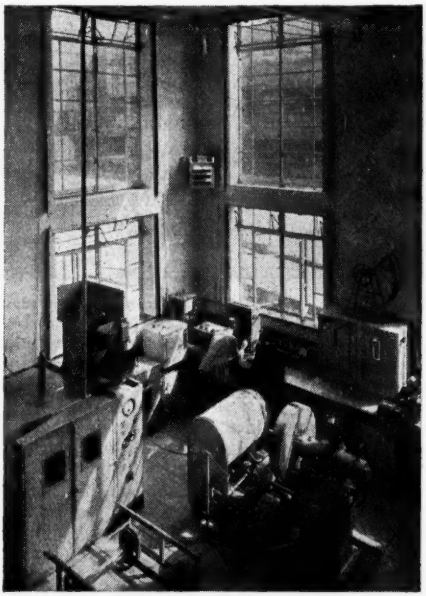


Stator of 60,000-kVA short-circuit alternator before lowering on to foundations

The high-voltage laboratory produces voltages equivalent to those caused by disturbances on electrical systems and apparatus due to lightning. Its equipment includes a generator for producing 3·2 million volts and power-frequency transformers for producing up to a million volts. Fundamental research is also carried out here on electrical breakdown phenomena in solid, liquid and gaseous insulation. An improved method of winding transformers to reduce impulse-voltage effects is on view.

The chemistry section is in two divisions, one for analytical work and the other for

organic chemistry in relation to the preparation and investigation of such substances as resins and plastics. In the insulation section, the main feature is a Schering bridge for up to 250 kV. There are also pressure-vacuum impregnating plant, extrusion machines and humidity ovens for studying all problems of insulation, especially those relating to plastics, oils, varnishes and solid materials.



Equipment used in the study of insulation problems

Standardization of electrical measurements and investigations into magnetic properties of materials are among the objects of the general physics laboratory. Magnetic testing includes iron-loss measurements at frequencies up to 20 kc, the determination of B-H curves and the ascertainment of crystal orientation in electrical sheet steel by the variations of Young's modulations determined by the natural frequency of vibration of a strip. Electric and magnetic fields are measured by the electrolytic tank method. A network analyser solves problems of power-frequency networks. The thermal conductivity of electrical insulating materials is another important subject of investigation here.

The vacuum-physics section is concerned with electronic valves, X-ray tubes, vacuum and gas-filled tubes. Included in the work carried out are the production and operation of high-frequency heating for de-gassing electrodes *in vacuo* and making kovar glass shields, filament and electrode structures for accelerating tubes in connection with high-voltage production and synchrotrons, X-ray pulses, cold-cathode sources of electrons and continuously pumped high-speed cathode-ray oscillographs for transient recording with electronic time bases.

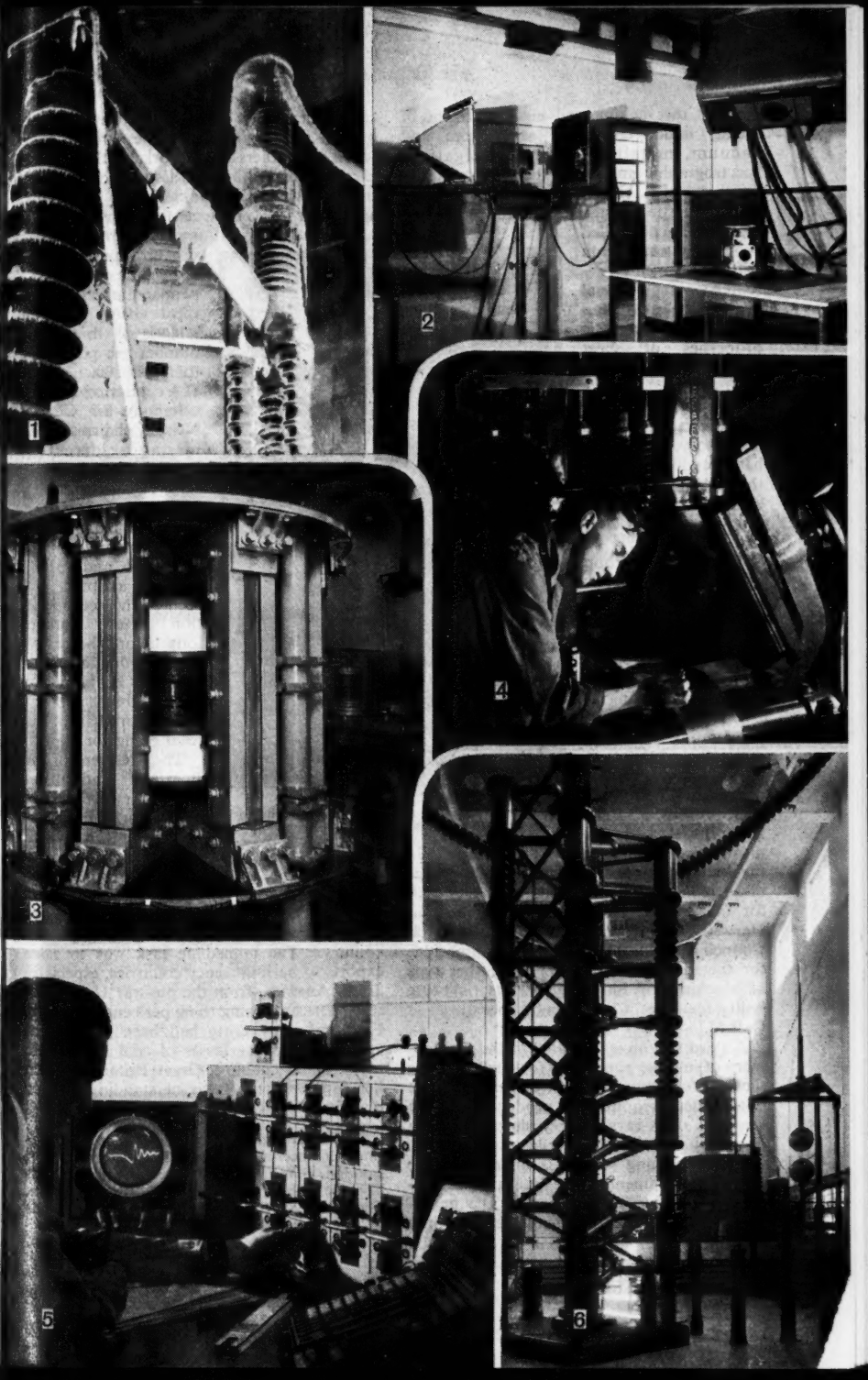
In the electrical section, in effect intermediary between the high-power and physics laboratories, there is mainly concentrated the equipment for special measurements of electrical phenomena. Its activities include measurements of breakdown voltage of different types of gap by oscillograph and transient indicating voltmeters, and determining the factors influencing deionization by separate applications of current and voltage pulses. There is also to be seen in this section of the laboratories a permanent-magnet operated contactor switching currents at low voltage and circuit breakers for the study of arc phenomena under controlled conditions.

To the radiological laboratory, with its 220- and 140-kV X-ray equipment, is assigned the duty of solving problems that cannot be conveniently dealt with by local X-ray equipment in the various works of the company, as well as more fundamental studies. The electronics section has the responsibility for the introduction of this pervasive form of measuring and control in the other laboratories, and shares with the vacuum-physics section the function of applying new vacuum devices. Fundamental work is also carried out at high frequencies.

In the metallurgical laboratory the principal

EQUIPMENT AT THE NELSON LABORATORIES (*See opposite page*)

1.—Air-blast circuit breaker for 132 kV after exposure to severe climatic conditions in the controlled temperature and humidity room. 2.—220-kV X-ray equipment. 3.—Synchrotron, 30 million electron volt, for accelerating electrons. 4.—Precision cold-rolling of electrical steel strip. 5.—Calculating board for the study of network transient phenomena. 6.—Impulse generator, 3·2 million volt.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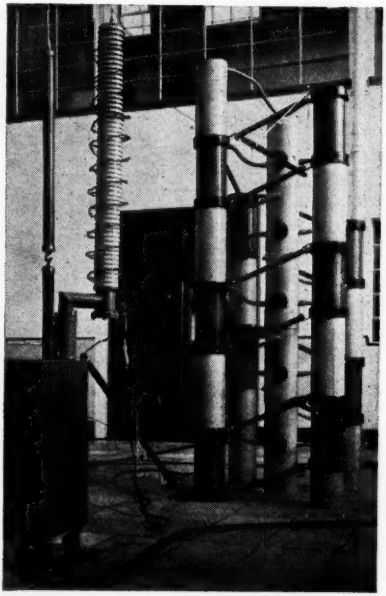
work is the melting and heat treatment of metals under controlled atmosphere and vacuum, metallographic investigation, spectrographic analysis and X-ray crystallographic work. Equipment is provided for preparing special steels from raw materials to the final cold-rolled product in connection with fundamental research on such special alloys as kovar and on the magnetic properties of sheet steel and high-temperature alloys used in gas turbines. As a part of this laboratory, equipment has been installed for the production of ceramics with special mechanical and electrical properties.



Impulse generator and accelerating tube for producing one-million-volt X-rays

The second group of laboratories is devoted to nuclear physics research in four sections. In the first of these are two electrostatic generators, one working at 2 million volts for accelerating electrons and the other at 5 million volts for accelerating electrons and protons. Both are insulated by nitrogen compressed to 400 lb per sq in. In the second section, synchrotrons with a range of 30 million electronic volts are being built for the Atomic Research Establishment at Harwell and for the Medical Research Council at Hammersmith and Cambridge for the treatment of cancer. Another type of machine, of 140 million volts, is being built for the Clarendon Laboratory at Oxford.

A third section is allocated to the development of impulse equipment (originated in the section) for the production of heavy current disturbances required to produce pulses of electrons or X-rays of very short duration; one application is the sterilization of food. In the remaining section is undertaken the design of equipment for the accurate measurement of dangerous radiations. The operation of unattended high-voltage machines can be viewed by means of a television set.

Both groups of laboratories are in close touch with others in the works of the English Electric Co. and in their associated concerns, the E.E. Valve Co., Napier's and Marconi's, and with Government research establishments and with similar organizations abroad. They now employ 350 people, about one-third being trained scientists, but the number is expected to reach 500.

At the opening ceremony Sir George Nelson, chairman and managing director, English Electric Co., referred to the health and other social services introduced by the company many years ago and to the means adopted to secure the co-operation of the workers long before the era of joint production committees. His aim was to double pre-war production, half of the total being for export.

The President of the Board of Trade, after inaugurating the Laboratories by pressing a button which initiated a 20,000-V, 10,000-A uncontrolled arc, followed by two others restricted to 0·1 and 0·01 sec, referred to the leading part that was being played by the English Electric Co. in reconstructing the trade of the country. The immediate task was to raise exports to hard-currency countries, especially South America, from the pre-war 15 per cent to 43 per cent, rising to 60 per cent next year. Electrical engineering had been of especial value in offsetting losses of coal and textile exports and enabling Great Britain to plan her future on the basis of standing on her own feet.

I.E.S. Convention Proceedings.—The Illuminating Engineering Society, 32, Victoria Street, London, S.W.1, has published the proceedings of the 1946 Convention in London. The price of the report (115 pp., illustrated) to non-members is 10s. 6d.

Views on the News

Reflections on Current Topics

I AM afraid that the public and the public press will never get the hang of all the intricacies of the electrical industry. One day last week, with the air of imparting secret information, the *Evening Standard* reported: "Big new jobs are now being distributed by Fuel Minister Gaitskell. He has to appoint chairmen for the five new regional boards that will administer nationalized electricity." It then announced that two of these appointments were to go to Mr. George Gibson and Alderman W. S. Lewis. A little inquiry would have acquainted the *Evening Standard* with the facts that there are to be fourteen area Boards and that Alderman Lewis was "designated" chairman of the Midland Board nearly three months ago.

* * *

Mr. C. T. Melling, the Luton borough electrical engineer, has sent me copies of leaflets which are being circulated to consumers in the area explaining the necessity for economizing in the use of electricity during the peak periods. In common with other undertakings, Luton has introduced an economy day and the leaflets (printed in a different colour for each of the five working days of the week), tell consumers which is their economy day, when there may be load cuts in their neighbourhood unless economy in the use of electricity is exercised. The reasons are simply explained, and the leaflets, which are addressed to housewives, shopkeepers, office and hotel managers, emphasize the need for maintaining supplies for industry so that production and exports may be increased, and—a point that will appeal to housewives—thus enable sufficient food to be imported from overseas.

* * *

I see that the Stretford Electricity Board's scheme, to which I have referred before, for giving discounts to householders saving at least 10 per cent on their last year's consumption was mentioned in the House of Commons last week and that Mr. Gaitskell said he would consider taking action to extend it to other parts of the country. Certainly this device for achieving a reduction in consumption is greatly to be preferred to any form of rationing, taxation or surcharge on "excessive" consumption. Should the scheme be generally adopted, it will not be surprising, however, if those patriotic householders who have already cut their consumption to the minimum are not resentful of the preferential treatment received by those who were not so careful last year.

* * *

As I hold the view that this country's political linen should not be washed in the eyes of the overseas public, I am pleased to hear of a "directive" addressed by the chairman of Tube Investments, Ltd., to all the engineering companies of that group. Mr. I. A. R. Stedeford says:—"Reports from overseas show that considerable damage is being done to confidence in Britain's future by irresponsible letters from business executives to customers in other countries. In giving reasons for delays in deliveries, or an inability to supply certain lines of products at the present time, there is a tendency to enlarge upon home difficulties and to predict further difficulties as a result of the Government's policy. While everybody is entitled to his own political opinions and to express them with vigour at home, business letters to foreign customers are not a suitable medium. Quite justifiable indignation and exasperation over official policy, when exported by those who are known to be responsible business men, can only serve still further to depress belief in Britain's ability to pull through. Not only that, but it must encourage overseas customers to seek alternative sources of supply, thus intensifying the economic difficulties in which the whole country is united in fighting."

* * *

In making his hearers' flesh creep I think that Mr. George M. Godsby, president of the Utah Power & Light Co., rather prejudged the results of nationalization in this country. Speaking at the annual meeting of the Rocky Mountain Electrical League he said:—"Don't take for granted what has happened in England could not possibly happen here. It can happen if politicians infected with Socialism or Crypto-Communism are not challenged at every step. Watch England closely. Use every opportunity of driving home to the American public the faults, failures and damaging effects of nationalization."—**REFLECTOR.**

Seventy-Five Years

"Electrical Review" and the Industry

TO-MORROW the *Electrical Review* completes three-quarters of a century, the first issue of the *Telegraphic Journal and Monthly Illustrated Review of Electrical Science* having appeared on November 15th, 1872. It was the third issue (January 15th, 1873) which bore the title *Telegraphic Journal and Electrical Review*. In that same year publication became fortnightly and the secondary title gradually assumed greater prominence until, in 1892, the name *Telegraphic Journal* was dropped altogether.

In the very first leading article it was pointed out that "while applied sciences of far less extent have several representatives in periodical literature, the applications of electricity have no special organ." Therefore, "in order in the future to collate the literature of the Science to one common centre, the *Telegraphic Journal* is added to the list of monthly magazines." Thereafter was set out the scope of the new paper which embraced "original papers contributed by eminent Electricians and Scientists"; abstracts of the proceedings of scientific societies; "abstracts of all memoirs which have appeared in the foreign journals during the month"; share-lists and city notes; a students' column; a list of letters patent; and "editorial notes of passing events."

The first issue included articles on submarine telegraphy; "An Application of Magneto-Electricity by Sir Charles Wheatstone"; "A Voltaic Standard of Electromotive Force" by Latimer Clark; a new thermo-electric pile (invented by Mure & Clamond); Duboscq's arc-lamp regulator; a note on a banquet to celebrate the opening of telegraphic communication with Australia; two book reviews and notes on new patents.

Among the advertisers were many names long since lost to memory; indeed the sole survivor, at least the only one to retain the same name, is the India Rubber, Gutta-Percha & Telegraph Works Co., Ltd.

Our jubilee (1922) occurred when paper was plentiful and we were able to make a real occasion of it. We hope that paper rationing may be a thing of the past when we celebrate our centenary.

Staggering of Factory Hours

Women's and Young Persons' Conditions

IN August, to facilitate the spreading of the electricity load by means of staggered hours in factories, the Minister of Labour and National Service made the Factories (Hours of Employment in Factories using Electricity) Order, 1947, to enable District Inspectors of Factories to authorize various adjustments of the provisions of the Factories Act, 1937, which governs the times of employment of women and of young persons under 18. This Order has been found "inelastic" in some respects as it does not provide for various schemes of hours which have been approved by Regional Boards for Industry. Accordingly the Minister, after consultation with the National Joint Advisory Council, has made the Factories (Hours of Employment in Factories using Electricity) (Amendment) Order, 1947 (S.R. & O. 1947, No. 2341, H.M. Stationery Office, price 1d.). In this a new provision is introduced in view of "powerless day" schemes involving a 4-, 4½- or 5-day week with an increased working day. This enables the Inspector to authorize a period of employment of 12 hours and a working day of 10½ hours (10 in the case of young persons under 16) in factories where not more than five days are worked in the week; and he may also, if the working days do not exceed four a week, authorize a period of employment of 12½ hours and a working day of 11 hours.

In exceptional cases the Inspector may authorize young persons under 16 to start work between 6.30 and 7 a.m. or to finish between 6.30 p.m. and 7.15 p.m. The women and young persons in a factory may be divided into not more than three sets (instead of two) with different working times; and in the case of rota schemes involving Saturday afternoon or Sunday work different half days or Sundays may be fixed for different sets. The provision of the original Order that, in certain circumstances, spells of work might be as long as six hours with a mid-spell break of 15 minutes has been extended to spells of work in the morning.

The Government has agreed that the new concessions with regard to an earlier starting time or later finishing time for young persons under 16 and the longer working day where not more than four days are worked in a week shall not be authorized without the agreement of the appropriate local trade union representative. It is still necessary for factory occupiers to obtain written permission from the District Inspector before they can avail themselves of any of these relaxations.

PERSONAL and SOCIAL

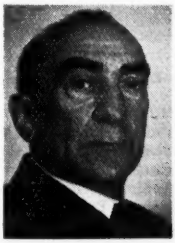
News of Men and Women of the Industry

IT is announced that **Mr. J. F. Stanley**, B.Sc., M.I.E.E., has been appointed an assistant technical director of the British Standards Institution. Mr. Stanley has been with the Institution for twenty-five years and for a number of years has had charge of its Electrical Section. The work of the Institution has grown rapidly during the past few years and the scope of the work which comes under his direct charge is as large as the whole work of the B.S.I. ten years ago. Mr. Stanley has served on several committees of the Institution of Electrical Engineers including the Wiring Regulations Committee and the Installations Section Committee. He is also a member of the Codes of Practice Committee for the Electrical Equipment of Buildings, a member of the Council of the Illuminating Engineering Society, and vice-chairman of the British Society for International Bibliography.

Mr. J. F. Stanley

Mr. D. St. C. Barrie, A.M.I.E.E., has been appointed assistant consumers' engineer with the St. Helens Corporation Electricity Department. Mr. Barrie has previously had experience with the Portsmouth and Fareham electricity undertakings and served with the Royal Engineers during the war, reaching the rank of captain.

Alderman H. Coates, J.P., M.I.E.E., chairman of the Watford Electric Lighting and Power Committee, has been elected Mayor of Watford for the second time during his twenty-five years' service as a member of the Town Council He was returned as a councillor in 1922 and in 1925 became chairman of the Electric Lighting and Power Committee in which office he has served continuously for twenty-two years except during 1936-37 when he was elected mayor. Alderman Coates, who is a director of the Watford Electric Manufacturing Co., Ltd., is well known in the electrical world.



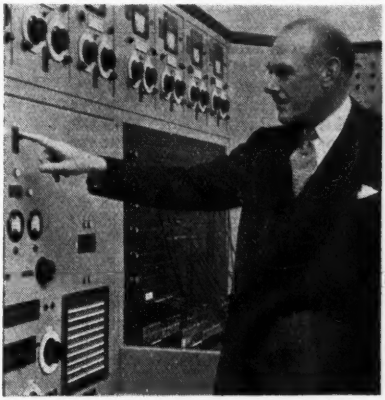
Ald. H. Coates

Mr. C. Parker, managing director of London Associated Electricity Undertakings, Ltd., and Central London Electricity, Ltd.. has been appointed chairman of these companies in succession to the late Lord Lytton.

Mr. G. Goulden, has been appointed to take charge of the technical section at the Building Centre, London.

Mr. E. H. Jordan, A.M.I.E.E., chairman of the Tees-Side Sub-Centre of the I.E.E. for the current session, was educated at the Grammar School, Bridlington, and Hull and Doncaster Technical Colleges, and received his mechanical training with Holroyd & Co., Rochdale, and his electrical training at Bridlington electricity works. In 1924 he was appointed junior charge engineer with the Doncaster undertaking and four years later joined the North Eastern Electric Supply Co., with whom he has been senior assistant engineer in charge of substations and waste heat power stations, constructional engineer in charge of d.c./a.c. and 40/50-cycle change-overs and the electrification of a large rural area, assistant district engineer, Northallerton area, assistant power engineer, Agricultural Section, and assistant district engineer, Middlesbrough area. He was appointed to his present position of assistant power engineer (southern area), in 1943.

Mr. E. H. Jordan



Mr. Oliver Lyttelton, M.P., starting up the a.c. analyser at the Willesden works of the British Thomson-Houston Co., Ltd. (See page 737)

At the invitation of the Scottish Section of the Electrical Wholesalers' Federation, the Council recently held one of its meetings at Gleneagles, to which the Scottish members were invited. The occasion was also marked by a certain amount of relaxation, the time being devoted to golfing and motoring, and the function closed with a dinner given by the

Mr. A. C. Baker (president) and Mr. A. F. Douglas (chairman of the Scottish Section) at a recent meeting in Gleneagles of the Council of the Electrical Wholesalers' Federation

Scottish members to their own Council, and to Council members of the Electric Lamp Manufacturers' Association. The accompanying picture shows **Mr. A. C. Baker** (Simpson, Baker & Co., Ltd.) president of the Federation, and **Mr. A. F. Douglas** (Drake & Gorham Wholesale, Ltd., Glasgow) chairman of the Scottish Section.

Mr. E. A. Logan, former borough electrical engineer of Erith, who is electrical engineer to the Government of Burma, has been appointed overseas representative of the Institution of Electrical Engineers in Burma. **Mr. J. S. Trelease** has been appointed the Institution's representative in the Transvaal in place of **Mr. V. Pickles,** who has resigned, and **Mr. F. C. Edmondson** representative in Western Australia in succession to **Professor P. H. Fraenkel,** who has resigned. The I.E.E. Council has confirmed the appointment of **Mr. C. Oldfield** as hon. secretary of the Victoria and Tasmania Committee of the Institution.

Mr. R. C. Golding, engineer and manager of the Southend-on-Sea Corporation Electricity Department, has been admitted a member of the Chartered Institute of Secretaries. Mr. Golding has also recently been awarded the "C" Certificate of the British Gliding Association.

Mr. D. C. Hagen has been appointed chief draughtsman to G. & J. Weir, Ltd. He has been with the company for thirty-six years.

Sir George Usher, Mr. F. G. Penny, the **Hon. Douglas Vivian** and **Mr. R. Armstrong** (secretary of the company), have joined the board of Senior Economisers, Ltd.

About 250 members and friends of the London Students' Section of the I.E.E. held an enjoyable dance at the Victoria Halls, Bloomsbury Square, London, W.C., on November 1st. The President of the I.E.E., Mr. Percy Good, and Mrs. Good, were among the guests and Mrs. Good presented the spot dance prizes.

The Wallasey and Birkenhead Electrical Trades Golfing Society wound up its season at the Leasowe Golf Club on October 30th, when forty members and friends competed for the Cryselco challenge cup and replica, which was the principal trophy of the event. The competition was followed by a hot-pot supper and entertainment. **Mr. B. T. Hawkins,** who presided, said he was very gratified at the support given to the society's activities during the first full season since the war. Mr. W. Foster proposed a toast to the visitors to which Mr. Elliott-Smith, of Bedford, responded. Mr. R. S. Owen won the challenge cup and replica with a return of 74 off a handicap of 6, and Mr. F. H. Ashworth secured second prize in Class A (handicaps scratch to 14). The winners in Class B (handicaps 15 and over) were Mr. H. D. Hardwick and Mr. R. M. Gravett.

Obituary

Air Commodore H. Leedham.—We regret to record the death of Air Commodore Hugh Leedham, managing director of Ericsson Telephones, Ltd., which occurred on November 5th at the age of fifty-eight years. Air Commodore Leedham was educated at Dudley Grammar School and Birmingham University, graduating in science and engineering. He became lecturer in the Dudley Technical College, but left there in 1915 to become wireless operator in the Royal Navy. Later as special lecturer at the Royal Naval College, Greenwich, he shared in the pioneer research work which resulted in a practical radio valve. After service overseas he returned to England to supervise the planning and building of the Electrical and Wireless School at Cranwell and was awarded the O.B.E. in 1929. From then to 1935 he was head of the Radio Division of the Royal Aircraft Establishment, Farnborough, Hants. In 1935 he went to the Air Ministry as assistant director of research and development (aircraft instruments) and during the years 1937-39, when radiolocation was developed, he was deputy director of radio research and development. From 1940 to 1943 Air Commodore Leedham was director of radio production, M.A.P., and was responsible for the production

The late Air Comdre. H. Leedham

of all radio and radar equipment for the R.A.F. and Fleet Air Arm and for all radar production for the Army. In 1941 he was awarded the C.B. for services in connection with radio-location and from 1943 he was director of radio research and development, M.A.P., from which position he retired in 1945 and in the same year became managing director of Ericsson Telephones, Ltd.

Mr. E. W. Hynes.—We regret to record the death, which occurred on November 5th, after a short illness, of Mr. Ernest William Hynes, for thirty-eight years a member of the staff of the Marconi International Marine Communication Co., Ltd. Mr. Hynes, who was fifty-nine years of age, joined the Marconi Co. in 1909 as a radio officer. He was transferred to the technical manager's department, head office, in 1912, and in 1925 became chief of stores. He remained in charge of stores in various capacities and at the time of his death held the position of service manager, fitting and stores.

Mr. E. W. H. Thomas, works manager for Richardsons, Westgarth & Co., Ltd., Hartlepool, until his retirement eighteen years ago, has died at West Hartlepool at the age of seventy-nine.

Mr. T. M. E. Ward.—The death occurred recently of Mr. T. M. E. Ward, A.M.I.E.E., meter superintendent with the Nottingham Corporation Electricity Department. Mr. Ward, who was fifty-two years of age, had been with the Nottingham undertaking since 1913, and had been meter superintendent since 1920.

PARLIAMENTARY NEWS

By Our Special Reporter

B.E.A. Salaries

IN a written reply to a question by Mr. Palmer, the Minister of Fuel and Power (Mr. Gaitskell) says that the salaries of the members of the British Electricity Authority are as follows:—Lord Citrine (chairman), £8,500; Sir Henry Self and Mr. J. Hacking (deputy chairmen), £5,000; Mr. E. W. Bussey (full-time member), £3,500; and Dame Caroline Haslett, Alderman Sir William Walker and Lt. Col. E. H. E. Woodward (part-time members), £1,000.

Mr. Gaitskell also states that the four Area Board chairmen who are to be members of the Authority (Messrs. J. Eccles, J. S. Pickles, H. J. Randall and Alderman W. Lewis) cannot be appointed until their Boards are formally constituted and they will not receive remuneration for their services as part-time members of the B.E.A.

International Telecommunications

Mr. W. R. Williams asked the Postmaster General why the Post Office was opening up cable communication with certain European countries where alternative means of communication by wireless existed, in view of the high transit charges on these cables and the fact that balance of traffic payments to these countries had to be paid in gold.

Mr. Paling said that an efficient international telecommunication system required the use of both line and radio circuits. Radio circuits were liable to interruption by electrical disturbance, and a basic system of line communication was essential for the maintenance of a regular service. A general diversion of traffic from line to radio circuits for the purpose of reducing transit outpayments would result in increased expenditure on wireless plant, less economic use of submarine cables partly or entirely British-owned, and a deterioration in the reliability of the services. Moreover, the number of wireless frequencies available was strictly limited. The necessity for economy in foreign currency outpayments was, however, always in mind.

Electric Passenger Vehicles

Wing-Commander Hulbert asked the Minister of Fuel and Power if electric passenger vehicles would be permitted to be used after November 30th. Mr. Gaitskell said that they would.

Dockyard Plant Repairs

Major Bruce asked the extent to which, since August, 1945, it had been possible to utilize the facilities offered by the Royal Dockyards in Great Britain for the repair and renovation of electrical generating plant.

Mr. John Freeman, who replied, said that orders for the repair and renovation of electrical generating plant were normally placed by the electricity undertakings with the original manufacturers, who were fully aware of the facilities available at the Royal Dockyards and had made certain use of them.

Economy Discounts

Commander Maitland asked the Minister of Fuel and Power whether he was aware of the proposals made by the Stretford Electricity Board, Lancashire, to give a discount to householders if they saved at least 10 per cent electricity, and whether if this scheme were successful he would consider taking action to extend it to other parts of the country.

Mr. Gaitskell's reply to both parts of the question was in the affirmative.

Machinery Priorities

Sir Stafford Cripps stated that priority was being given, at present, to machinery for the development of fuel and power resources and atomic energy.

Fuel Utilization

Coal Economy Measures

IN a letter to the chairman of the Fuel Utilization Sub-Committee of the Parliamentary and Scientific Committee Mr. H. Gaitskell, Minister of Fuel and Power, expresses his views on the Interim Report on Fuel Utilization submitted to Mr. Shinwell by the Committee in June. Mr. Gaitskell says that he is in entire agreement with the principles enunciated in the report that if all industrial demands for coal cannot be met in full there should be a system of "priorities" in allocation and that full efficiency should be encouraged, rewards being gained by those firms which show greater efficiency than others.

There are formidable administrative difficulties in the way of any effective informal or voluntary rationing scheme for the sale of electric fires. The possibility of controlling sales by a licensing system has been considered but the administrative difficulties would be great, particularly as the manufacture of fires is not an exclusive or difficult operation. Raw material allocations to manufacturers have, however, for some time been cut to very low levels. Regarding the proposal in the report for the marketing of cheap oil heaters, the Minister says that this is impracticable as the necessary supplies of kerosene cannot be made available in present circumstances.

Local Publicity Campaign

Referring to the publicity campaign for economy in the non-industrial use of gas and electricity, he says that 455 local committees have been formed and it is the aim to have a fuel economy committee in every centre of population of more than 10,000 inhabitants. Mr. Gaitskell says that conversion from coal to oil burning already carried out, or authorized, represents the maximum commitment he can accept having regard to the quantity of oil which can be assigned for the purpose.

Increase of electric generating capacity has the highest priority and every possible step is being taken to accelerate the provision of new stations. The periods quoted for the erection of various stations are somewhat misleading as they include delays imposed by suspension of progress during the war.

The closest possible liaison is maintained between his Ministry and the Ministry of Transport with regard to the supply and movement of coal wagons. The increase in mechanical mining methods at the coal face undoubtedly resulted in deterioration of the quality of deep-mined coal during the war years but to a lesser extent than is popularly supposed. Every effort is being made by the National Coal Board to effect improvement despite the handicap of plant shortage coupled with the fact that changed mining methods have altered the grading and cleaning characteristics of the coal so rendering some cleaners obsolete.

While there is no doubt that the general supply of coal to industry has deteriorated, the advice of the Minister's fuel engineers has enabled industry to adjust its methods of use so as to maintain its output. Special problems are, however, presented in iron and steel production, carbonization and the generation of electric power and the latter, affecting as it does nearly all other industries, has therefore been singled out for first attention. An experiment is being undertaken in the use of heavy fuel oil to upgrade the slack coal burned in chain-grate stokers at three power stations. If this is successful output should be increased when additional fuel oil becomes available after the completion of the present coal-oil conversion programme.

Correspondence

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Export Difficulties

WE have read with interest your leading article on "Electrical Exports" in your issue of October 31st. You paint a very rosy picture in the last paragraph of this editorial for the future, but nothing whatsoever is mentioned about the difficulties which British manufacturers face in practically all overseas countries in respect of import licensing restrictions overseas.

These restrictions will fall heavily on British manufacturers unless the Government can take action and remove them. Otherwise there is no doubt that in many electrical lines, exports will cease completely to many overseas destinations, simply because the buyers in such overseas countries cannot obtain the necessary import permits and cannot, therefore, place repeat orders.

The present figures mean nothing and, in our case, unless immediate Government action is taken, the export figures will not rise, nor can they even be maintained, but will drop heavily as the individual buyers cannot get the necessary import permits to place new orders.

BRITISH GENERAL MFG. CO. (1941), LTD.
*London, S.E.*1. J. VALENTINE,
Sales Director.

Electric Drive for Cargo Ships

Marine Engineers' Discussion

DURING the war there was a considerable reawakening of interest in the possibilities of electric drive for propulsion of ships. Not only in the United States of America where marine engineers are perhaps more electrically minded than are their confrères here, but in this country also a number of notable vessels such as the Anglo-Saxon Company's oil tankers and the Canadian Pacific Company's *Beaver* class cargo liners have recently been built with electrical propelling machinery.

With the demand for higher service speeds and the consequential need for increased propulsive power, if becomes imperative to employ prime movers having a high speed of rotation in order that the deadweight of the propelling machinery can be kept down to the minimum. But if high-speed engines are employed, some system of speed reducing gearing between the engine and the propeller shafts must be used, since the speed of the propeller must be kept comparatively low if the maximum propulsive efficiency is to be obtained. Thus, the electric drive must be regarded as essentially a system of speed reduction although its many other advantages, including its flexibility and the ease with which reversing can be effected, will not be lost sight of.

On Tuesday and Wednesday of this week, a symposium on " The Engining of Cargo Vessels of High Power " was convened by the Institute of Marine Engineers in London when six papers were presented and discussed, covering every type of prime mover (with the exception of the venerable reciprocating steam engine) and in no fewer than four of the papers the possibilities of the electric drive were investigated. The terms of reference of the symposium called for the consideration of installations of 7,500 h.p. on a single shaft and of 13,000 h.p. on either single or twin shafts. We need not here discuss the papers by Dr. T. W. F. Brown entitled " The Geared Steam Turbine " and by Mr. C. C. Pounder on " The Direct Coupled Diesel Engine," except to note that they are worthy of study since, not only in both cases is the auxiliary machinery electrically driven, but they also indicate the merits of the types of propelling machinery which are now being extensively adopted.

Turbo-Electric Propulsion

Alternatives to the geared steam turbine were discussed in a paper entitled " Turbo-Electric Propulsion " contributed by Mr. C. Wallace Saunders and Mr. T. Halladay Turner, whose facts were based upon actual practice. To ensure reliable boilers, the relatively easy steam conditions of 500 lb/sq in. and 800 deg F total temperature were adopted and it is suggested that with powers as low as 7,500 s.h.p. these conditions represent nearly the optimum overall efficiency of boilers, turbines and auxiliaries with little to be gained by the use of higher steam pressures or temperatures unless reheating between stages is employed. The steam turbine suffers from the great disadvantage that it cannot be reversed and it is not the least of the many advantages of the turbo-electric system that it eliminates the astern turbines.

The transmission losses are higher than with mechanical gearing and for the installations in question they were found to be 7·3 per cent, made up of alternator 3 per cent, motor 3 per cent, excitation and fan 1·3 per cent. The speed reduction ratio with 120 r.p.m. on the propeller shaft is 26 to 1, giving a turbine speed of 3,120 r.p.m., which is not too low to get a good overall turbine efficiency for the desired powers of 7,500 to 13,000 s.h.p. Particulars of the electrical equipment were not mentioned as they had been given by one of the authors in a previous paper, but it may be stated that the trial results showed a fuel consumption (boiler oil of calorific value 18,500 B.Th.U./lb) for all purposes of 0·603 lb/s.h.p. Using a single-screw arrangement in an installation of 13,000 s.h.p., a single turbo-alternator would have an efficiency 2 per cent better than that of the 7,500 s.h.p. installation.

From the point of view of capital cost, figures are given for similar American ships which show that as between geared turbine and turbo-electric machinery the price was 1·3 per cent in favour of the former. Reference was also made to the fact that there is little or no maintenance work to be done when the ship is at sea.

Diesel-electric Method

The problem of " Diesel-Electric Propulsion," which was discussed in a paper by Mr. J. G Belsey and Mr. J. G. Robinson, differs radically from that of turbo-electric propulsion as the fundamental principle with the former appears to be the use of a large number of small high-speed diesel-driven generators, all of them supplying power to a single propulsion motor. In the opinion of the authors the development of the 300-450 r.p.m. range of engines during the war years makes this class of prime mover the most attractive for the project under consideration and they give machinery space layouts showing five or seven engines, each driving a 2,300-V three-phase alternator for both the 7,500- and the 13,000-s.h.p. vessels. The engine units in the latter case are necessarily of greater power and have a greater number of cylinders, but for both installations the normal speed of the propulsion motor is 110 to 120 r.p.m.

Since the variation in speed of the propeller shaft is obtained by varying the frequency of

the current from the alternators, it is considered desirable to adopt 220 V d.c. for the auxiliary services. Various alternatives are put forward for obtaining this d.c., such as exhaust heat boilers in conjunction with steam engine driven dynamos, the boilers being run on oil when the vessel is in port, or a separate diesel dynamo set can be installed.

Comparative data show the weight of the various installations, the space occupied and the estimated fuel and lubricating oil consumption. On the question of cost, it is admitted that under present conditions it is impossible to obtain accurate comparative figures, but the engine makers indicate that for the 7,500-s.h.p. installation the total cost of the indirect prime movers will be about 70 per cent of that for a single direct-driving diesel engine of equal power. When the electrical equipment is taken into account the total cost of the installation would be higher, but for powers above 7,500 s.h.p. the relative cost of the electric drive becomes progressively lower. There is, moreover, the intangible availability factor which is far greater for the multi-engined electric installation in that one unit can be laid off at a time for overhaul or repair while at sea with only a very slight effect on the sea speed of the ship.

The advantages of the high-speed diesel engine are so considerable in comparison with the heavier directly coupled type that it was only to be expected that attempts would be made to employ some form of mechanical gearing between the engine and propeller shafts in order to obtain the desired speed reduction ratio. Owing, however, to the fluctuation of torque inseparable from the use of the reciprocating engine taken in conjunction with the fluctuation in propeller torque when the vessel is proceeding in a rough sea, rigid toothed gearing has proved unsatisfactory unless used with some form of elastic coupling.

Electro-magnetic Couplings

Mr. C. C. Pounder, whose paper on the low-speed direct-coupled diesel engine has been noted above, contributed another entitled " The Geared Diesel Engine " in which he described the characteristics of the electro-magnetic coupling and indicated how its use in conjunction with toothed gearing gave the necessary degree of flexibility as well as the desired speed reduction ratio. Various forms of magnetic coupling are available, in some of which the slip between the two elements is used to generate low-frequency current which excites the secondary element. If secondary excitation is provided from an external source, a coupling is obtained in which there is no slip.

There is a further design in which reversal of the direction of rotation can be effected at the coupling by reversing the rotating field. This has the considerable advantage that it permits of the elimination of the reversing mechanism on the engine itself, although the coupling is heavier and the space it occupies greater. For the 7,500 s.h.p. installation Mr. Pounder suggests the use of either two or four engines, each driving a pinion through a magnetic clutch, the pinion in turn driving a gear wheel directly coupled to the propeller shaft at the desired propeller speed. For the 13,000-s.h.p. vessel a twin screw arrangement is suggested, each screw to be driven as in the smaller installation.

It is estimated that as compared with directly-coupled engines the geared diesel arrangement would consume about 5 per cent more fuel, but the machinery weight would be about 18 per cent less. Similarly, the space saved in the geared diesel engine room is about 20 per cent. As regards cost, for the engine powers under consideration the position is probably one of equality, but for larger powers it could be made favourable to the geared drive granted suitably chosen engine units.

Gas Turbines

In a paper entitled " The Combustion Turbine " Mr. J. Calderwood recognizes that at the present stage of development only tentative proposals can be put forward, but in any case the gas turbine is a high-speed machine and, like the steam turbine, it is non-reversible. Mr. Calderwood therefore puts forward two schemes for an installation of 13,000 s.h.p. in one of which electric drive is proposed while in the other mechanical gearing is employed in conjunction with a reversible propeller. For this power the reversible propeller is as yet untried whereas the electric drive can be regarded as fully established. It would appear therefore as though, granted the development of an economic internal combustion turbine, its use on board ship would open up the possibility of a new field for the application of the electric drive, not only to yield the necessary speed reduction ratio between the turbine and the propeller shafts, but also to eliminate the necessity for the inclusion of astern running turbines.

Finally, as regards the fuel for turbines of this type, there is good reason to believe that if good combustion can be maintained, the heavier grades of oil could be satisfactorily burned and it has even been suggested that pulverized coal could be used. In any case, Mr. Calderwood suggests that if an overall efficiency of 35 per cent can be obtained, with the small overall dimensions and the low weight of the installation, it should prove an attractive commercial proposition.

German Lamp Production

The Philips incandescent lamp works at Aix la Chapelle have resumed production and it is hoped to manufacture shortly 180,000 to 200,000 lamps monthly. Germany at present manufactures only 10 per cent of the pre-war output of incandescent lamps and it is unlikely that this figure will be improved substantially in the near future owing to the shortage of wolfram and other raw materials.

Earth-Leakage Directional Relays

By S. A. Daines,
A.M.I.E.E.

TO the engineer who is not well grounded in metering the understanding of the directional type of protective relay can be confusing. It is essential to comprehend the importance of polarity, not only of the relay coils and terminals but also of the current and potential transformers associated with them. Especially is this true with the earth-leakage directional relay, which, under the normal load conditions, is carrying neither current nor potential.

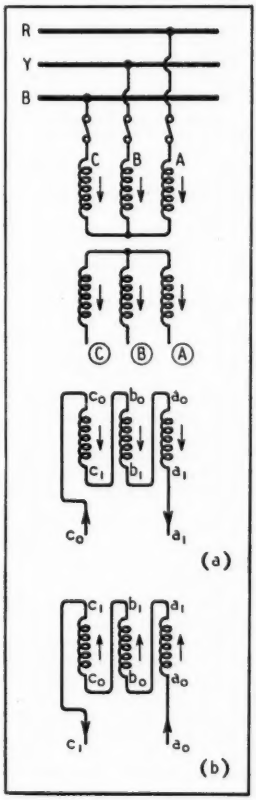


Fig. 1.—Directions of current flow in tertiary winding of potential transformer. (a) correct, (b) incorrect

Too often is the wiring diagram of the manufacturer issued (and followed) showing the labelled terminal connections only, without, for instance, enough reference to the polarity of the open-delta tertiary windings of the potential transformer. With current transformers, old or new types, it is generally easy to know reliably what the direction of the current flow will be through the relay-current coil under fault conditions, dependent

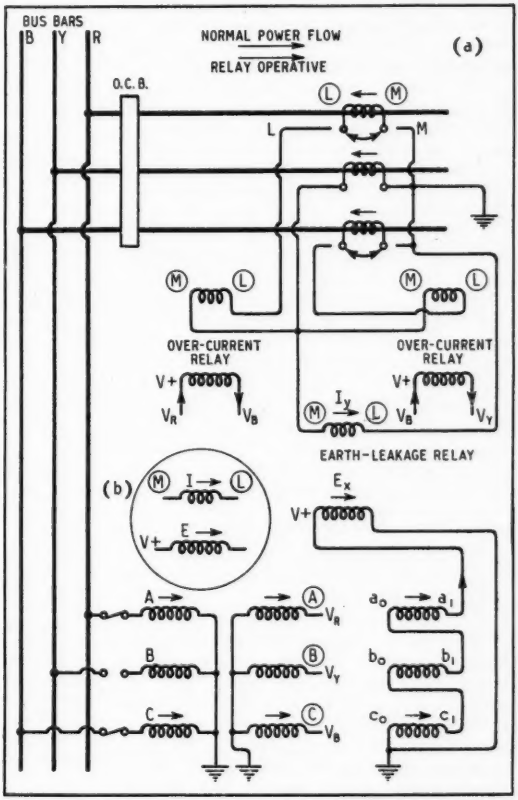


Fig. 2.—(a) Red and blue phase current-transformer short-circuited; yellow phase high-voltage fuse removed; (b) Polarities of relay circuit

always upon whether the power flow is towards or away from the busbars. This is not so general with the potential transformer and the relay potential coil.

Consider Fig. 1 (*a*) showing a potential transformer complete with tertiary winding having all polarities labelled in a manner leaving no doubt in the user's (or reader's) mind. Such complete polarity marking is rare in wiring diagrams and it is not difficult in the absence of such marking for one to assume the tertiary to have the exact opposite polarity, as shown in Fig. 1 (*b*). The provision of arrow marking is exceedingly helpful.

Such doubts as may arise can, of course, be eliminated by a systematic checking of the relay operation on load. Most check testing put forward has the confusing disadvantage of obtaining results exactly opposite to those met with under true fault conditions. An alternative method, which gives results in line with fault conditions, is preferable as this obviates the necessity of interpretation.

The red and the blue phase current-transformer secondaries are disconnected and short-circuited, thus allowing the yellow c.t. secondary current to circulate through the earth leakage relay current coil in the same direction as it would under fault conditions. The yellow high-voltage fuse is then removed from the potential transformer and the relay will be observed to operate, if correctly connected, as it would on a yellow-phase earth fault.

Wiring Diagram

Fig. 2 (*a*) is the wiring diagram in which the letters M and L (primary) and (M) and (L) (secondary) indicate current-transformer polarity, i.e. if current travels from M to L in the primary winding then current travels from (M) to (L) in the *external* circuit of the secondary winding. For the relays, the principle is adopted that if current and voltage in phase with each other (or displaced by less than 90 deg) are impressed on the relay coils with polarities as shown in Fig. 2 (*b*), then the disc of the relay is said to have positive torque and the relay contacts tend to open. Thus the (M) and (L) terminals of the relays correspond to the normal "in" and "out" current terminals respectively of a c.t. operated kWh meter, and the V+ terminal of the relay to the "in" shunt terminal of the same type of meter.

The relevant vectors are set out in Fig. 3, from which it appears that the torque tending to close the contacts is k I_y E_x cos $(180 - \theta)$ or $-$ K cos θ, where k is a constant depending on the units used, K = k I_y E_x and cos θ is the power factor of the load.

Similar tests on the other phases may be carried out by removing the high-voltage fuse on any one phase of the p.t. and also disconnecting and short-circuiting the c.t.'s on the remaining two phases.

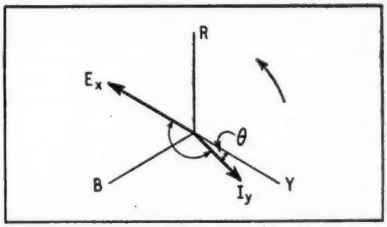


Fig. 3.—Vectors of relay currents and voltage

Electricity in Poland

DOMESTIC use of electricity in Poland is restricted this season between October 1st and February 29th by means of a two-part tariff, which applies to consumptions above 10 kWh for each room per month; above that amount the charge is 7½ times the normal. All power stations are required to keep a two-months' supply of hard fuel, making 800,000 tons in the aggregate. In most cases, however, storage facilities are inadequate.

Electricity is now exported from the Walbrzych (Waldenburg) area to Czechoslovakia, but much more will doubtless be done in this way as the output of the mines is expected to reach 100 million tons within the next few years. This will include enough slack and low-quality coal not suitable for export and not easily stored to enable electricity to be produced for transmission to other countries despite the growing demand of home industries. The existing 110-kV (40,000-kVA) single-circuit link with Czechoslovakia is being reinforced by a double-circuit 220-kV line capable of carrying more than 100,000 kVA.

At present there are seventy power stations, operating mostly on brown coal but including some hydro-electric plants, in western Poland with a total rated capacity of 622,000 kW, representing about one-third of that of the country. About three-quarters of the 21,740 miles of high- and low-voltage networks was destroyed during the war, but in 1946 4,600 miles were rehabilitated and over 6,000 miles more were undergoing repairs.

By 1949 the capacity of generating stations in western Poland should increase by 325,000 kW. A 118-mile-long line is to be erected between the power stations at Wroclaw (Breslau) and Upper Silesia.

Ship Welding

THERE was probably more welding done in ship work than in any other single industry said MR. J. L. ADAM (chief surveyor, British Corporation Register of Shipping) in his presidential address to the Institute of Welding.

Mr. Adam first explained why the ship classification societies (six were in active existence, never more than eight) were unique in their constitutions and not paralleled in any other industry, his object being to indicate how those societies were related to the shipping community and, incidentally, to welding work in ships.

Much of the criticism of ship welding, particularly in relation to vessels built under the emergency programme in the United States, was ill-informed and unfair. The proportion of American ships in which serious trouble developed was relatively small and many of the defects were due to faulty detail design which would probably have caused trouble in any ship. Remembering that 2,600 ships of 10,000 tons deadweight, representing eight million tons of steel, were built ot the same design (something that had never been done before) it was not surprising that some 4 per cent did develop faults. For instance, the steel used did not always conform to the usual specification, while the time factor affected routine procedure and normal practice.

Mr. Adam dealt at some length with the American ships because he considered it necessary to correct the idea that there was danger in building welded vessels in normal times to classification rules and requirements. That wartime experiment, apart from being justified by the exigencies of the situation, had been of the greatest value to the shipping community generally.

Mechanical Handling

THE first National Mechanical Handling Exhibition, organized by *Mechanical Handling*, will be held in the National Hall, Olympia, London, from July 12th to 21st, 1948. The exhibition will be supported by the Mechanical Handling Engineers' Association, Materials Handling Export Group, Industrial Truck Manufacturers' Association, Association of Crane Manufacturers, Truck and Ladder Manufacturers' Association and Foundry Trades' Equipment and Supplies Association, Ltd. The display will include every type of British mechanical handling plant and equipment, and concurrently with the exhibition there is to be a convention and industrial cinema for the open interchange of views, methods and the showing of advances in the technique of mechanical handling in the general scheme of production. In a message just before he ceased to be President of the Board of Trade, Sir Stafford Cripps said he welcomed the exhibition as a means of demonstrating to British industry and the world the progress which was being made towards the solution of one of our biggest production problems. Special arrangements are being made to publicize the exhibition to buyers throughout the world and with the assistance of the Export Promotion Department of the Board of Trade arrangements are being made to contact buyers through that Department's representatives and agents. A considerable amount of space for the exhibition has already been disposed of, and concerns anxious to participate should make early application to *Mechanical Handling*, Dorset House, Stamford Street, London, S.E.1.

Brisbane Tramway Equipment

EQUIPMENT has recently been dispatched by the G.E.C. for the supervisory control of switchgear used in connection with track supplies to the Brisbane Tramways. By means of this equipment switchgear in five different substations can be remotely controlled and supervised from one central control point. Control is effected from a number of panels, on each of which is displayed a miniature diagram of the substation concerned. By means of coloured lamps on the panels the control staff can see at a glance whether any circuit-breaker, transformer, rectifier or similar unit is "on" or "off" and are instantly informed of any change that takes place. Many of the items of switchgear can be remotely switched by means of keys provided on the panel. Every switching operation, whether initiated from the common control point, or locally at a substation is automatically recorded on the panel. Meters are also provided for the remote measurement of feeder currents and voltages at any of the controlled substations. The supervisory equipment incorporates standard items of telephone apparatus, including relays and uniselectors, many of which are standardized by, and in regular production for, the British Post Office. The system is quick, efficient and foolproof in operation and requires only two pairs of pilot wires between control and each substation. The equipment now being put into service in Australia is similar to that supplied to Brisbane over seven years ago.

Although it is impossible at present to meet all requests for the *Electrical Review* from would-be readers at home, we are given a special paper allocation for subscriptions from, or on behalf of, people overseas. Those who would like to send the *Electrical Review* to friends abroad (particularly as a New Year present) are informed that the annual subscription (including postage) is £2 7s. 8d., or £2 3s. 4d. for Canada

NEW BOOKS

Sampling and Production Control. Television Circuits.

Statistical Methods in Research and Production. By Owen L. Davies, M.Sc., Ph.D. Pp. 292; illus. and index. Oliver & Boyd, Ltd., Tweeddale Court, Edinburgh, 1. Price 28s.

This book has been written with special reference to the chemical industries, and I.C.I., Ltd., are to be congratulated on its publication, not only for their farsighted policy in putting the resources of their statistical research organization at the disposal of all, but also for the clear and concise explanations given in the book of a subject which a great mass of published literature has never been able to simplify.

The book has the advantage of being written by a team of statisticians and research workers who are able to draw for examples, etc., on their great wealth of experience, thus giving a practical angle to each section concerned. While written with particular reference to one industry, the work will be of primary interest to all engaged in engineering production. Of special appeal will be Chapter 2, containing some very easy explanations of frequency grouping and curves, and special reference is made to normal distribution and tests for normality. The inspection staffs of undertakings engaged on mass production will also find the notes on sampling of considerable interest when read in conjunction with Chapter 3, which deals with measures of dispersion, such as range and standard deviation.

The practical man, however, may wish to jump straight from Chapter 3 to Chapter 8, which deals more fully with sampling. In the same way, inspection department personnel will find Chapters 3, 8, and 9 of more appeal from a works point of view, as it is rarely the function of production staff to deal directly with such matters as analysis of variance, covered in Chapter 5, and correlation, in Chapter 6.

All production and factory managers will find much of interest in Chapter 9, dealing with control charts, as the many practical examples given make the explanation clearer to those experimenting in this field. Page 211, however, offers a poor definition of the function of quality control, which embraces far more than " simply the use of control charts as part of a continuous inspection system." It is to be regretted, also, that when dealing with control charts a special section was not allocated to " fraction defective " methods, as it can be estimated that in the majority of cases of functional sampling carried out in industry, no exact terms of measurement are available.

To sum up, there is much of appeal in the book to the practical man as well as laboratory and research workers and it has the added advantage that the reader lacking a higher statistical education will find no problem in coping with those sections of direct practical interest to him, such as the sampling or control chart chapters. It is unfortunate, however, that the price places the book rather beyond the reach of the average student just entering the industrial production or research field.—A.S.W.

The J. & P. Switchgear Book. By R. L. Lythall, M.I.E.E. Pp. 645; figs. Johnson & Phillips, Ltd., Charlton, London, S.E.7. Price 25s., or 20s. to educational authorities.

The fourth edition of this useful and practical work brings the two volumes of the previous issue under one cover, thereby adding to its convenience and improving the general layout. Intended for the non-specialist user and students, the book covers the full range of its subject (not being in any way limited to the products of its publishers) and includes such associated matters as the calculation of fault currents, protective systems, neutral earthing, voltage regulators, switchboard instruments and reactors. A chapter is given to maintenance, erection and testing and another to the relevant Factory Regulations. Among much new material are sections on air-blast circuit breakers, supervisory control and flameproof switchgear.
—C.O.B.

Television Explained. By W. E. Miller, M.A. (Cantab.). Trader Publishing Co., Ltd. Distributed by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Price 3s. 6d., postage 2d.

Receiver circuits are dealt with step by step, with the aid of 44 line diagrams and twelve illustrations of picture faults. This 52-page book is written in a simple non-mathematical style while circuit splitting into more or less self-contained sections should enable beginners more readily to follow their intricacies. But the book is mainly addressed to knowledgeable members of the public who are acquainted with radio circuits and equally interested in their television counterparts, as well as to service engineers who have to install the sets and maintain them in operation.—W.O.F.

Books Received

The Technique of Stage Lighting. By R. Gillespie Williams. Pp. 194; figs. 71, coloured plates and index. Sir Isaac Pitman & Sons, Ltd., 39, Parker Street, London, W.C.2. Price 21s.

The Atom and its Energy. By Prof. E. N. da C. Andrade, D.Sc., Ph.D., F.R.S. Pp. 196; figs. 17; index. G. Bell & Sons, Ltd., York House, Portugal Street, London, W.C.2. Price 10s.

Electro Technology and Calculations. By M. G. Say. Pp. 159; figs. and index. George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2. Price 6s.

Network Analysis

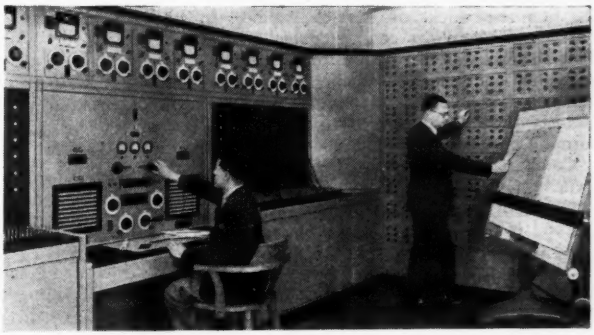
Inauguration of First Machine in London for General Use

INITIAL steps towards the provision of an a.c. network analyser were taken before the war. Development of the "machine" was resumed, at the instigation of the Electricity Commissioners, in 1941 by the British Thomson-Houston Co., Ltd., at whose Willesden works the completed apparatus has now been installed. Mr. Oliver Lyttelton, M.P., chairman of Associated Electrical Industries, Ltd., performed the inaugural ceremony last week.

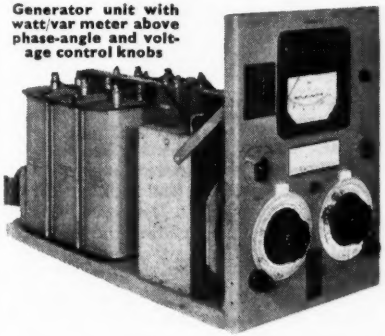
It is the first full-size analyser of its kind in Britain, probably in Europe, and will quicken the evaluation by direct measurement of the electrical characteristics of equivalent full-scale power systems, enabling the effects of abnormal system changes to be accurately predicted in a fraction of the time needed for ordinary computation.

It is thus the means of performing in a practical way many investigations that are otherwise prohibited by the laboriously protracted mathematical calculations involved. But the scope of the analyser is not limited to electrical problems, or the solving of differential equations; it can be employed for studies, which prove to be intractable by normal calculation, in mechanics, acoustics, thermotics and other sciences capable of analogous representation by electrical equivalents.

The analyser is composed of small variable resistors, reactors, capacitors, transformers with impedances and coupling units of sundry types (also means of metering the units so built up) and sources of voltage that are adjustable in magnitude and phase, which may be interconnected to form model miniature equivalent counterparts of the generators, transmission lines, loads and other components of the power system being studied.



Part view of a.c. network analyser, indicating how schedule of objectives to be investigated is set up



Generator unit with watt/var meter above phase-angle and voltage control knobs

To limit the physical size of the "board" to economical and easily workable dimensions, nominal values of 50 mA at 50 V and 500 c/s have been adopted; these basic quantities enable telephone type apparatus to be used for the interconnecting and switching functions, so saving considerable space. But the quantities to be calculated are immaterial because the system characteristics to be investigated are first computed as percentages of a selected voltage and kVA base before the problem is "set up" on board; the results of the analysis are finally interpreted into system values with the aid of appropriate factors.

All the metering controls and the majority of the supply circuits are in the centre cubicle, readily accessible to the seated operator. There are vertical jack panels on either side

with disk fronts forming the shelves for numbered plugs, which are the terminations of corresponding circuit elements housed in the wing cubicles. Desired interconnections are effected by inserting selected plugs into the appropriate jacks.

In the connections to the plugs of each circuit element unit (excepting those of the generator units and coupling transformers) is a telephone relay. The contacts of the latter normally provide straight through connections while the relay coils are wired to the numbered jacks on the selector boards on either side of the central control panel. Thus the insertion of a dummy plug (only one of which is normally available) into a jack will operate the corresponding relay to connect the unit concerned to the busbars forming part of the metering system.

Compared with the use of telephone key switches, which necessitates all the leads being brought back to the control desk, this method is doubly advantageous in reducing stray capacity in the leads and rendering it impossible accidentally to select two units simultaneously, thus introducing "sneak" circuits with risk of short circuit damage.

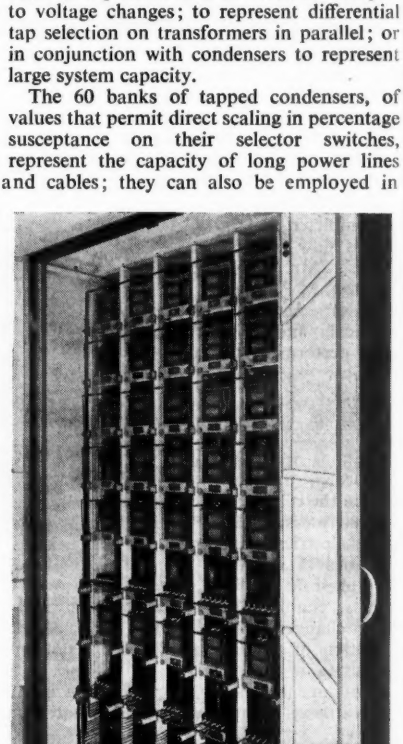
Generator Units

There are twelve generator units in a row at the top of the centre cubicles of the "board," each incorporating a multi-range W/VA (r) meter to assist in setting the dials of two regulators. The primary input is derived from three-phase 500-c/s busbars while the secondary output, which is of constant magnitude but variable in phase through 360 degrees, passes to the second regulator which can vary the voltage from zero to 285 per cent without appreciable phase change. The reactance of the two controllers is compensated for by series capacitance, so that load regulation is negligible. It is thus possible to obtain different voltages from twelve sources, each of which can be separately varied in magnitude between the stated limits and set to any phase angle relative to the chosen reference.

There are 120 line and 30 load impedance units, consisting of tapped reactor banks and non-inductive resistors. The former are used as series circuit elements whereas the latter serve as shunts, or as series elements of higher value to represent, for example, a long overhead power line. They are variable in value by selective switches.

There are 36 auto-transformers, each with a range of $\pm$ 30 per cent in 1 per cent steps, used in conjunction with the impedance units to represent load at situations subject to voltage changes; to represent differential tap selection on transformers in parallel; or in conjunction with condensers to represent large system capacity.

The 60 banks of tapped condensers, of values that permit direct scaling in percentage susceptance on their selector switches, represent the capacity of long power lines and cables; they can also be employed in



Rear view circuit element housing in analyser wing

place of the generator units to represent small synchronous condensers.

There are coupling transformers (12 of 1 to 1 ratio, two of 2 to 1 ratio and two of $\sqrt{3}$ to 1 ratio for simulating the effects of manual coupling between circuits. Twelve metered jumper circuits are provided. Indicating instruments are normal, except three "masters" (voltmeter, ammeter and W/VA (r) meter which are all operated by negative feed-back valve amplifiers to avoid imposing burdens on the circuits into which they may be inserted. Multiple ranges are obtained by the use of current shunts and voltage dividers.

To provide a convenient phase reference for the currents and voltages being measured, a phase shifting device is mounted on the main control panel and feeds a variable resistance load. Thus the adjustable output from this circuit can be matched with values obtained from points in the "set-up" network, using the master instruments, so that the phase angle of the network quantities can be readily determined.

The three-phase 500 c/s busbars of the analyser are energized by a motor-generator, which is controlled from the centre desk of the "board," whence the input voltage can be varied by selector contactors. Normally the synchronous motor of this set is driven from the 50 c/s works power mains; to guard against variation of mains frequency, an auxiliary three-phase 50-c/s generator driven by a d.c. motor has been provided. The input voltage to both these sets is controlled within $\pm$ 0·2 per cent by two electronic regulators.

The layout of the installation has been arranged with regard for the convenience of visiting engineers, to enable them to prepare in comfort and expeditiously collate preliminary data subsequently to be "set up." It will be operated by the British Thomson-Houston Co., Ltd., Ferguson, Pailin, Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., but not exclusively, for this calculating machine is now available for use by accredited representatives of all British engineering concerns, which should communicate direct with the A.E.I. Network Analyser Department, 20, Neasden Lane, Willesden, London, N.W.10.

S.R. Electrified Services

Discussion at Institution of Electrical Engineers

THE first comprehensive account of the complete scheme of electrification of the Southern Railway is given in the paper read by MR. C. M. COCK (chief electrical engineer, S.R.) at the Institution of Electrical engineers last week.

The author based his data on the stabilized conditions of 1939, when the extensive programme of conversion from steam traction was interrupted by the outbreak of war. The paper is mainly descriptive, but indicates some operating results and quotes costs and total expenditure. It states the reasons for conversion and shows that it has been fully justified on both suburban and main lines.

There still remains opportunity for obtaining substantial increases of traffic and revenue by extending electrification on some lines. But so much has already been exploited as to render that opportunity a diminishing quantity. It will become speculative when, for operational reasons, more complete conversion has to be considered. Therefore future justification will rest on the margin of saving on operating expenses of electric services as compared with those of similar steam services.

It is estimated that complete electrification of the Southern Railway to the east of the Portsmouth line will provide an adequate return on the capital expenditure involved. Plans have been announced for the immediate electrification of 284 route miles, approximating to 610 single track miles, including a small proportion of sidings.

New equipment for suburban services will be capable of an acceleration of 1·5 m.p.h. per sec and express multiple-unit trains and locomotives will be built for a maximum speed of 90 m.p.h. Traction motors have been introduced which weigh 1·92 tons as compared with the existing 3·6-ton motors of the same power.

Diesel-electric traction is to be used on some lines; fifteen locomotives for shunting and three of 1,600 b.h.p. each for main lines are already under construction.

Much thought has been given to the best method of working goods trains. An electric locomotive fitted with auxiliary diesel power for shunting movement over non-electrified lines may be cheaper and more mobile than alternatives.

MR. JOHN ELLIOT, general manager of the Southern Railway, who opened the discussion, said that railway management was not interested in electrification as such, but only in the movement of trains over its tracks. The Southern Railway had to move into and out of London in 2½ hours in the morning and 2½ hours in the evening just over half a million people. They were convinced that electrification had no equal for their problem; it meant rapid movement and punctuality. During the last four weeks the average late arrival of all trains at all the London terminal stations, in spite of fog and other troubles, was just under three minutes. Electrification had also made it possible to provide services on the "even time" system, so that passengers did not have to bother about time tables. With all the equipment available, it was possible in non-peak hours to run short trains continually up and down the lines, thus building up a very considerable business and giving the public good service.

SIR JOHN KENNEDY (Electricity Commission)

expressed regret that, originally on the South Western system, the 50-cycle system of power supply was not adopted. It also seemed unfortunate now, he said, that 1,500 V, which was recommended by the Kennedy Committee in 1920, was not adopted when the South Eastern section was electrified, because future development would be handicapped by the conductor rail system. With 1,500 V, goods traffic could be worked by electricity without any trouble. The Southern Railway was not at the moment using its capital investment in electrification to the best advantage, because 25 per cent of its traffic (the goods traffic) was still steam-hauled. If the goods traffic were electrically hauled it would be handled mainly at night, without needing any addition to the generating plant capacity or to the bulk supplies bought, so that the average cost per kWh used would be very much reduced. In that connection, it was interesting to find that the Southern Railway paid 0·48d per kWh for the grid supply, compared with 0·475d given in the Weir report. He had certain misgivings about the introduction of diesel-electric locomotives. They would not provide that reserve of power which was so important, or ensure cleanliness and a good atmosphere in tunnels. The diesel-electric locomotive might be suitable as a temporary expedient, but complete electrification should be the ultimate goal.

Speed and Energy Cost

MR. H. W. H. RICHARDS (L.N.E.R.) mentioned that on the North Tyneside line, where the average distance between stations was about one mile, increasing the scheduled speed from 20 to 23½ m.p.h. meant an increase in the cost of energy of about 15 per cent, while to go up to 25 m.p.h. would mean an increase of 35 per cent. On a suburban electrification the cost of the energy supply (including substation maintenance and depreciation, the conductor system, etc.) amounted to about half the total train-mile cost, so that obviously the cost of energy and scheduled speed were most important. On suburban services the train heating might represent 16 per cent of the maximum demand in winter and lighting about 3 per cent, so that only about 80 per cent of the maximum demand was for traction. The Southern Railway electric locomotive was of 1,470 h.p. and weighed 101 tons, but the latest Swiss double-bogie locomotive weighed only 79 tons and developed just under 4,000 h.p.

MR. F. A. HARPER (L.M.S.) said that on the main lines of the L.M.S., if freight as well as passenger services were electrically hauled, they would expect a load factor of at least 70 per cent. On the Southern, with its smaller amount of goods traffic, the figure would probably be about 50 per cent, which was the figure given in the Weir report for the whole of the British railways. Apparently on the Southern the electrical gear, apart from the control gear, was stripped after about 100,000 miles. On the L.M.S. there were motors which had run over 300,000 miles with only minor attention. Their normal period for inspection and light attention for control gear was 50 days, but as an experiment they had left an equipment running for 500 days without attention and it still showed no sign of trouble.

MR. R. BROOKS (Metropolitan-Vickers), emphasizing the reliability of electric railway equipment, pointed out that from the figures given in the paper it appeared that only 0·2 per cent of the delays on the railway were due to the electrical equipment of the trains.

MR. H. H. SWIFT (L.N.E.R.), commenting on the proposed introduction of a 275-h.p. traction motor weighing only 1·92 tons, pointed out that this meant only 15·4 lb per h.p. and was getting down to the weight of an a.c. traction motor, a great step in the right direction.

Motor Suspension

MR. F. WHYMAN (Metropolitan-Vickers) said that there was so much experience throughout the world of d.c. axle-hung, nose-suspended motors being satisfactory, even at the highest speeds, that he was surprised to find the Southern contemplated going back to resilient drives. The latter, he thought, owed their origin to the shortcomings of a.c. traction and to add their complication to the simplicity of a d.c. locomotive would not have a beneficial effect and, from the point of view of rail wear, might be detrimental.

MR. C. M. COCK, replying to the discussion, said the 25-cycle power supply system was originally adopted because at the time the rotary convertor was the only satisfactory way of coping with the traction conditions, but they were intending to make an alteration as soon as possible. He agreed that it was time that goods traffic was hauled electrically; it was under active consideration. They did not favour a lightweight locomotive for freight haulage, because it was necessary to deal with loose-coupled goods trains. With electric traction for goods trains they would expect a load factor of about 50 per cent. For normal goods service the energy consumption of the locomotive might be as low as 35 watt-hours per ton-mile, while for the purely suburban service it might go up to 85-90.

Hospital Electrical Equipment

THE electrical equipment of a modern hospital was the subject of the national lecture of the Association of Supervising Electrical Engineers, which was delivered at Nottingham by Mr. J. Tomlinson.

Most of the points raised in the subsequent discussion concerned static electricity in operating theatres. The lecturer, in reply, pointed out that the remedy was not so much elimination as an endeavour to keep everything at the same potential in order to prevent any likelihood of a discharge causing sparking.

COMMERCE and INDUSTRY

Ferranti's Birthplace. Equipment for Netherlands Railways.

A BRONZE plaque now identifies the premises 130, Bold Street, Liverpool, as the birthplace of Dr. S. Z. de Ferranti. The plaque, provided by members of the Institution of Electrical Engineers, was unveiled last week by Mr. V. Z. de Ferranti in the presence of members of the Mersey and North Wales Centre. Just about a year ago, at the annual dinner of the Centre, it was remarked that the birthplace of this eminent electrical engineer, no more than two or three minutes' walk from that venue, had no memorial or plaque to signify its historical interest. That omission has now been repaired.

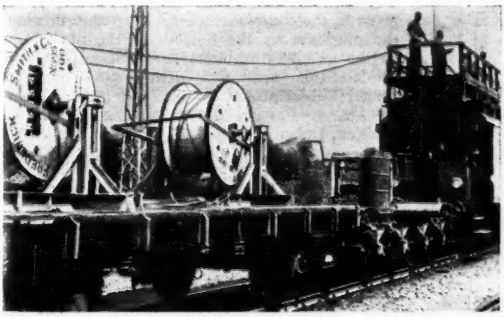
Grierson's Silver Jubilee

We offer our congratulations to Grierson, Ltd., engineering and electrical contractors, on attaining their silver jubilee this year. The company, which was formed in 1922, retains many of the personnel who have been actively associated with it since its early days, including Mr. J. L. Musgrave (chairman), Mr. C. J. Mills and Mr. C. S. Wright (directors and chief engineers) and Mr. H. P. Musgrave (director and secretary). The electrical installations of many of the largest public buildings, schools, factories, flats, hospitals and churches in the country have been carried out by the company.

Public Speaking Competition

The E.D.A. public speaking competitions which were held at regular intervals before the war, have now been revived, and full particulars are contained in a brochure now issued by the Association.

As a means of discovering talent, the competition should be of value, but the primary object is to encourage sales staffs and other members of electricity undertakings to study



public speaking, and to train themselves to proficiency. The brochure sets out the purpose and method of holding the competition, the conditions of entry, methods of judging, together with details of the awards. Entry forms for those wishing to take part in the competition should be returned not later than December 12th.

Export Drive Window Display

In the accompanying picture we show one of the windows on the ground floor of Crown

B.T.H. export drive window display

House, Aldwych, London, the head office of the British Thomson-Houston Co., Ltd., which is being used for a very effective display showing the part the company is playing in the export drive. A large aerial view of the B.T.H. main works at Rugby is surrounded by illustrations depicting typical products of the company which are being exported to many parts of the world.

Netherlands Railway Reconstruction

The Netherlands Railways suffered severely during the war and the task of rebuilding has been a formidable one. The new equipment has included many hundreds of tons of trolley wire and strand, which have been supplied by Frederick Smith & Co., Ltd.

Overhead lines, supplied by Fredk. Smith & Co., Ltd., in course of erection on the Netherlands Railways

Plastics Exhibition

An Exhibition of Plastics was held at the Birmingham Council House from October 23rd to 25th. The exhibits on the stand of Tufnol, Ltd., showed the influence of plastics in the industrial life of the city. Bearings, gears, pulleys, aircraft and marine craft components,

motor car parts, electrical insulators and radio accessories, all made of Tufnol, demonstrated the value of laminated plastics to almost every industry.

Chinese Ambassador at Strowger Works

The Chinese Ambassador, Dr. Cheng Tien-Hsi, on November 3rd visited the Strowger Works of the Automatic Telephone & Electric Co., Ltd. This was the Ambassador's first visit to Liverpool, and he was accompanied by the Chinese Consul in Liverpool, Mr. M. S. Loh. Mr. W. S. Vick, works manager, told the Ambassador that the company had manufactured and shipped 8,000 telephone instruments to China on the instructions of U.N.R.R.A. and was at present engaged in producing rural automatic telephone exchanges for use in China.

Industrial Truck Demonstration

Several new types of industrial electric trucks were demonstrated at the London Airport, Heath Row, on October 6th by Lansing Bagnall, Ltd., Worton Road, Isleworth. Accompanying the latest type of " Model O " 2/3-ton platform truck which has been popular for nearly thirty years was the new " Model D " 10/12-cwt truck incorporating a new patented circuit. Instead of the usual series motor, a 1½-h.p. shunt motor operated from 48-V, 72-Ah car type batteries is used to drive the twin rear wheels. The control equipment, which is contained in a box measuring only 7 in. by 5 in. by 6 in., gives any desired speed from 0 to 9 m.p.h.

Lansing Bagnall " Model D " platform truck

Automatic acceleration and current control are provided together with regenerative braking. The motor cannot be overrun and the main contactor always opens on no-load. There is a pre-selector for reversing. On test the truck with a load of 6½ cwt travelled over 20 miles on one charge. In addition to its own platform capacity it is capable of towing a 3-ton trailer load. It will surmount gradients of 1 in 5. In the near future the incorporation of a motor-generator set will eliminate the necessity for a separate charger and enable the truck to be charged from any a.c. mains. The truck is 8 ft 6 in. long and 3 ft wide, the platform being 5 ft long and 3 ft wide. Either car type or vertical steering is available and a driver's canopy can be fitted if desired. The model shown had a fixed platform but an elevating type is also to be produced. There were also examples of the American Baker electric pallet, stacking and articulated fork trucks for which the company is sole concessionaire and distributor in this country.

Television Equipment Contract

Pye, Ltd., has received a contract from the British Broadcasting Corporation for a complete outside broadcast television van, including camera equipment. This installation is based on the design recently demonstrated on the Continent, and the equipment, including pick-up tubes, will be made at Cambridge.

Co-op. Electrical Association

Following a trade show of electrical domestic appliances, radio and fluorescent lighting fittings made by the Co-operative Wholesale Society, there has been formed a National Association of Co-operative Electrical, Engineering and Radio Managers. Mr. G. Broadley, electrical manager of the Leeds Co-operative Society, has been appointed secretary.

Canadian Appliance Supplies

Almost double the number of electric washing machines and refrigerators were available in Canada during the first eight months of the year compared with 1946, manufacturers and importers supplying 154,000 washers and 61,066 electric refrigeration units.

Old Cornish Beam Engine Saved

British Timken, Ltd., and the Fischer Bearings Co., Ltd., have sent a donation of £25 to the Cornish Engines Preservation Society. It is given to the endowment fund started following the purchase by the Society of the old beam engine which in its later years worked on East Poole Mine near the main Truro-Penzance road. Subscriptions to the fund may be sent to Mr. J. Pascoe, deputy chairman, British Timken, Ltd.

Fluorescent Tramcar Lighting

A successful experiment in fluorescent lighting has recently been carried out by the British Thomson-Houston Co., Ltd., in three of Blackpool's modern single-deck tramcars. Special " Mazda " fluorescent lamps were employed, operating in series on a line voltage of approximately 500 V d.c. In devising the electrical circuit for these lamps, consideration had to be given to the numerous breaks in the supply line which would normally manifest themselves to

passengers in the form of lamp "blinking." Thirty-two lamps were used giving an overall illumination, at reading level, of 25 lumens per sq ft.

Radio Components Exhibition

The fifth of the series of private exhibitions, admission by invitation only, organized annually by the Radio Component Manufacturers Federation, will be held at Grosvenor House, Park Lane, London, from March 2nd to 4th, 1948. Improved arrangements are being made for manufacturers and agents from abroad who are interested in the export trade.

Cheltenham Showrooms

The Cheltenham Electricity Committee recently recommended that premises belonging to the Corporation in the main shopping centre should be used for the electricity showroom at present housed in the Municipal Offices. An amendment to this recommendation was moved suggesting that the showroom should be situated in the administrative offices at "Southwood," which is distant from the shopping centre. In the ensuing discussion it was suggested that in view of nationalization the Electricity Department should "die gracefully," that any electrical needs were well catered for by public traders, and that in any case the present time was not propitious for encouraging the use of electrical apparatus. The amendment was carried by 12 votes to 11.

Exchange of Students

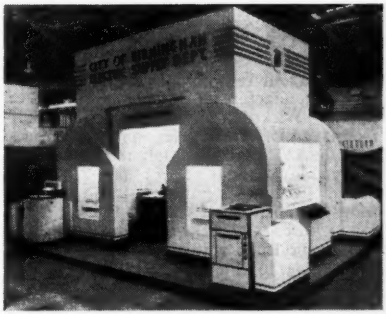
A conference of the organizers of the international exchange of technical students initiated in 1946 by the Imperial College, London, Vacation Work Scheme in collaboration with the British Council and certain Continental and Scandinavian universities and technical colleges, will be held at the Imperial College from January 5th to 9th, 1948. Representatives from nine Continental and Scandinavian countries will attend.

Aluminium Prices

The Minister of Supply announces that as from November 6th the price of virgin aluminium in notch bar form has been increased from £80 to £82 10s. per long ton delivered into consumers' works.

Midlands Ideal Homes Exhibition

The Midlands Ideal Homes Exhibition was held recently at Bingley Hall, Birmingham, after a lapse of eight years. Over 250,000 people visited the exhibition and judging from inquiries received a good proportion visited the City of Birmingham Electric Supply Department's information bureau. Although no attempt was made to stage a comprehensive display of domestic electrical apparatus, some major appliances including a refrigerator, wash boiler, washing machine and cooker, were exhibited. Under the caption "More power requires more steam, more steam requires more coal," the relationship between the use of electrical appliances, the power station and coal, was illustrated by means of an illuminated diagram. Push-buttons controlled the illumination of any one of six appliances, together with the illumination of the power station boiler and the appropriate amount of coal required to operate the particular appliance for one hour. Advice was given on the



Birmingham Electric Supply Department's stand at the Midlands Ideal Home Exhibition

use of electricity during off-peak periods and the methods of load shedding adopted by the Department to minimize the inconvenience to consumers if cuts became necessary were illustrated by a map showing the "day by day" means of zoning.

Egyptian Trade Restrictions

The *Board of Trade Journal* reported recently that the Egyptian authorities had decided to restrict imports to essential goods up to the end of this year. No official list of essential goods has been published but it is suggested that a list which has appeared in the Egyptian *Journal du Commerce* may be used as "a rough working guide." This list includes electric generators and motors, accumulators and batteries and parts, lamps, telegraph and radio-telegraph apparatus, signalling apparatus, electro-medical equipment, cables and insulated wires, and carbons.

Australia Restricts Dollar Imports

The Australian Trade and Customs Minister has announced that unexpired licences to import goods from dollar areas can now be confirmed only if the goods were in transit on October 21st or if covered by irrevocable credit.

Hungarian Electrical Industry

Exports of the electrical engineering industry play a prominent part in Hungary's foreign trade, amounting this year to about

12 per cent of total shipments of manufactured products. The value of the industry's annual production is estimated at about 62 per cent of its peacetime volume but it is hoped that output will be stepped up considerably under the country's three-year plan. Production is concentrated chiefly on radio apparatus, cables, accumulators, motors, transformers, etc.—*Reuter* (Budapest.)

Reports on German Industry

Recently issued reports on German industry, copies of which can be obtained from H.M. Stationery Office, include the following:—B.I.O.S. 1269, "Test Gear for Frequency Modulation and Television" (3s. 6d.). B.I.O.S. 1567, "Manufacture of Aluminium-Clad Steel Strip by Wickede Eisen- and Stahlwerke" (1s. 6d.). J.I.O.A. 1-3, "German Underground Installations." Part 1, Unique Design and Construction Methods (25s.); Part 2, Adaptations of Existing Facilities (4s. 6d.); Part 3, Various Installations of General Interest (12s.). B.I.O.S. Misc. 4C, "Schwingmetall: A Process for Bonding Rubber to Steel Used Primarily for Mountings to Eliminate Vibration" (1s. 6d.).

Canadian Exports and Imports

During the first half of this year Canada's exports of electrical goods were valued at $10,049,000 as compared with $11,465,000 during the same period of 1946 and $2,191,000 during the first half of 1938. During the six months Canada's imports of such goods were valued at $34,225,000 in 1947, $22,084,000 in 1946, and $6,607,000 in 1938.

Trade Announcements

Cryselco, Ltd., announce that Mr. J. R. Bardsley has been appointed their Leeds branch manager in succession to Mr. G. Redmond, who has been transferred to the Birmingham branch in succession to Mr. W. La Brum, who has retired.

The Electric Construction Co., Ltd., has appointed Mr. P. Denniston Lang as its agent for Scotland. Mr. Lang will operate from 115, Sword Street, off Duke Street, Glasgow, E.1 (telephone: Bridgeton 1667).

The Newcastle office of **Laurence, Scott & Electromotors, Ltd.,** has been removed to Baltic Chambers, Quayside, Newcastle-on-Tyne. The telephone number remains unchanged.

Mr. D. E. Noad, Scottish area manager of **Venner Time Switches, Ltd.,** has now removed to 66, Dalkeith Road, Edinburgh, 9.

Plysu Products, Ltd., is now operating from its new offices and factory at Woburn Sands, Bletchley, Bucks. (telephone: Woburn Sands 2229).

Mr. I. S. L. Clunas, of **C. A. Parsons & Co.'s** London office, has been transferred to the company's Bristol office, 15, Great George Street, Park Street, to assist Mr. J. L. Packard.

Mr. S. B. Begley has joined **Belling & Lee, Ltd.,** as sales engineer covering the Midland area and working from his home 5, Blakeley Avenue, Tettenhall, Wolverhampton.

Mr. G. Horsfall has been appointed to the technical sales staff of **Electro Methods, Ltd.,** and will cover Lancashire and Cheshire. His address is 51, Uplands, Alkrington, Middleton, Manchester.

Charles Selz, Ltd., have opened new showrooms at 25, Oxford Street, W.1 (opposite Frascati's Restaurant), where they are displaying lampshades, wrought iron electrical fittings, etc.

Changes of Name

The following companies have changed their names:—**Industrial Engineering, Ltd.,** to Kelsey Industries, Ltd.; **Chadderton Radio & Television Products Co., Ltd.,** to Aerotron, Ltd.; **Duplex & Pearson, Ltd.,** to Lamgals, Ltd.; and **Austin & Rodliffe, Ltd.,** to R. G. Robertson (Refrigeration), Ltd.

Trade Publications

Dussek Bitumen & Taroleum, Ltd., Empress Wharf, Bromley-by-Bow, London, E.3.—Technical brochure (No. 3/473/7-A) on solid grades of "Trinidite" compound for cable jointing and switchgear filling for up to and including 11 kV.

Associated British Oil Engines, Ltd., 32, Duke's Court, St. James's Street, London, S.W.1.—Brochure on the self-contained 55-kW ABOE-Brush diesel-electric generating set.

Farmer, Stedall & Co., 145, St. John Street, Clerkenwell, London, E.C.1.—Priced wholesale catalogue of cables and conduit, wiring accessories, lighting fittings and domestic appliances of various makes.

Perihel, Ltd., Edge Street, London, W.8.—Illustrated broadsheet of the company's "sun lamps."

Barlow-Whitney, Ltd., Coombe Road, Neasden Lane, London, N.W.10.—Priced leaflet (X1/1047.S) on electrically heated glue pots and folder (Y6/1047.S) on furnaces of various kinds and sizes.

Barries Electrical Agencies, Ltd., King Street, Brighton, 1.—Priced list (No. 20947) of cables and flexible wires of all types.

Senior Economisers, Ltd., 11, Southampton Row, London, W.C.1.—Brochure on "Twin-tube," welded and H-tube types with line illustrations of boiler arrangements in many well-known power stations.

British Electrical & Manufacturing Co., Ltd., 7, Clavering Place, Newcastle-on-Tyne, 1.—Catalogue and price list of "Woodlight" pendants, wall brackets and table lamps made of seasoned oak.

Courtney, Pope (Electrical), Ltd., Amhurst Park Works, Tottenham, London, N.15.—Catalogue and price list of fluorescent lamp fittings; maintenance scheme available.

Applicants for the above should write on their firms' notepaper.

RECENT INTRODUCTIONS

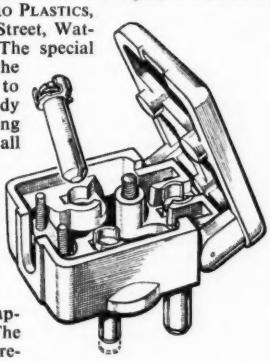
Notes on New Electrical and Allied Products

Window Fan

AN extraction fan built on the same lines as the original " Xpelair," but in a moulded casing, is announced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. It is fixed to the window glass by a rubber cushioned clamping ring and the 7·5 in. diameter fan is mounted on four rubber cushions to minimize noise and vibration. The cylindrical casing and external cowl are formed of a plastic moulding in chocolate brown. Air is extracted at the rate of 230 cu ft per min; the internal loss of volume is reduced to 6·5 per cent and the a.c. motor rated at 25 W, designed specifically for this fan, has " Saso " self-oiling sleeve bearings which are self-aligning.

Hinged Plug-top

Rectangular plug tops of unusual design are now being made in the three-pin, 5 and 15 A sizes by ELECTRO PLASTICS, LTD., Milton Street, Watford, Herts. The special feature is that the cap is hinged to the plug body instead of being loose as in all other types;



Plug top with hinged cap and withdrawable pins

it is secured by a single captive screw. The plug pins are removable for easy wiring, fitted with patented terminal and large-headed clamping screw, and a positive cable grip is also provided. All threads are die cut while the moulded body is of generous section to ensure robustness.

Corrosion-Resisting Fluorescent Fitting

A fluorescent lighting fitting which is specially designed to resist corrosion is announced by the BRITISH THOMSON-HOUSTON CO., LTD., Bridle Path, Watford, Herts. It will accommodate one or two 5-ft, 80-W tubes and is made of " Perspex " except for the two rubber end-covers which permit the air within the fitting to expand and contract without " breathing " the surrounding atmosphere. The interior is thus protected from fumes, dust and steam. Lampholders and starter switches are assembled in the fitting and are protected, but the necessary chokes and capacitors are mounted away from the fittings. To facilitate lamp changing one of the lampholders is fixed while the other " floats "; it is only necessary to remove the appropriate rubber end-cover and the lamp can be withdrawn through the end of the fitting. This dustproof Cat. F.809 fitting is very appropriate in such places as cigarette factories and flour mills.

Vertical Isolation Switchgear

The range of class ALA·1 switchgear made by CROMPTON PARKINSON, LTD., Astor House, Aldwych, London, W.C.2, has been extended. The normal rating is 600 A at 6·6 and 11 kV with a breaking capacity of 150 MVA (see *Electrical Review*, June 30th, 1947, p. 1013) whereas the addition is of 250 MVA capacity, being substantially similar and of exactly the same dimensions as the original. The metalclad oil breaker is isolated vertically having air insulated busbars, current transformers and connections. The withdrawable truck is a completely welded structure running on roller bearing wheels. Any form of tripping gear can be fitted and closure can be effected by manual, solenoid, or spring mechanism.

Unit Air Heater

An air heater of the unit type, the " Spirette," is being made by the SPIRAL TUBE & COMPONENTS CO., LTD., Osmaston Park Road, Derby. The flush-finished steel casing is rectangular with four adjustable horizontal louvres. A perforated metal guard encloses the nickel-chrome wire element of 4 kW for dissipating 13,500 B.Th.U. per hr. On the reverse side is a propeller type fan driven by a 30-W motor, which may be of the single-phase, 200/250 V, or three-phase, 400/450-V type. The weight of the heater is 19 lb complete.

Electrically Heated Oil Radiator

A radiator constructed of seamless steel tubes filled with oil and mounted on castors for mobility, which is now being manufactured in England, is becoming available from OCEAN HOME APPLIANCES, LTD., 99A, Park Lane, London, W.1. The heating element is submerged in the oil, which circulates through the vertical tubes. The ratio of surface area to element rating is claimed to prevent the surface temperature exceeding 189 deg F, which is not too hot to be touched by children and domestic pets. A three-heat switch (800 W to 1·2 kW) is provided and a water-tray humidifier is nested within the coiled tubes, which are cream-enamelled. The radiator is 26 in. in height and length by 8 in. in width and weighs 77 lb.

N.Z. Power Policy

Concentration on Hydro-Electric Resources

SUPERIMPOSED on the delays in obtaining additional plant, the abnormally dry weather experienced in the past two summers in New Zealand has resulted in a serious shortage of electricity. This has given rise to criticisms regarding the Government's policy in not providing steam generating plant for standby. In his annual report for the year ended March 31st last the general manager of the State Hydro-Electric Department, Mr. F. T. M. Kissel, expresses the conviction that the electrical needs of the country can best be met by concentration on the major hydro-electric schemes.

In a foreword to the report the Minister in charge of the Department (the Hon. R. Semple) says there is one possibility not to be overlooked, namely the use of natural steam for power generation. It is proposed to investigate these potentialities immediately and to put down trial bores in suitable locations. Under present conditions, he says, it is very desirable that the electricity supply should be independent of imported fuel, and to this end they should develop the country's natural resources.

Progress of Schemes

Good progress has been made with the various constructional schemes, although conditions in Great Britain have seriously delayed the delivery of equipment. At Maraetai, the site of a new 180,000-kW station on the Waikato, the construction of the diversion tunnel is well under way. Large quantities of machinery have already arrived and all the plant should be available by the end of 1948. In connection with this scheme a new village at Mangakino represents a serious attempt to better the living conditions of the men who are constructing these essential works. At the same time investigation work is proceeding on the next Waikato project at Whakamaru. In the South Island it should soon be possible to go ahead with the actual work on a new 300,000-kW station on the Clutha River and investigation of a development at Lake Rotoroa has commenced.

The total quantity of electricity generated in the North Island was 1,718 million kWh (by Government plants, 1,656 million) compared with 1,636 million (1,576 million) in 1945-46. The introduction of severe rationing caused many operating difficulties. In the South Island 753 million kWh was generated (against 625 million).

For the purpose of making electricity available in the more sparsely settled parts of the Dominion, the Electricity Act, 1945, requires all supply authorities to contribute to a central fund a levy of 5s. per cent on sales of electricity, and from this fund grants are made towards approved rural line extensions. It is estimated that some 3,000 to 4,000 miles of new line will come within the scope of the scheme. Ninety extensions have so far been approved covering the building of 603 miles of line for supplying 992 consumers. The estimated capital cost is £292,469.

Revenue from the North Island system in 1946-47 amounted to £2,023,237, and after meeting operating costs, interest and depreciation but no payment for loan redemption there was a balance of £56,670. Income tax, social security and national security taxes require £132,624, leaving a deficiency of £75,954. Including £315,876 for the past year, loan redemption arrears now amount to £692,408. South Island revenue totalled £1,086,339 and the balance of £284,972 has been used for income tax, etc. (£111,230) and loan redemption.

Future of the I.M.E.A.

Smaller Undertakings' Proposals

REFERENCE was made in our last issue to a memorandum circulated by the Council of the Incorporated Municipal Electrical Association to its members in advance of a meeting at which the Association's future is to be discussed. It is apparently the Council's desire that the Centres shall submit schemes, either for co-ordination before the meeting or for consideration at the meeting.

The first set of proposals to come to our notice emanates from the Committee of the Smaller Municipal Electricity Supply Undertakings of which Alderman S. Myott and Mr. A. J. C. DeRenzi, both of Newcastle, Staffs, are respectively chairman and hon. secretary. In a memorandum to the I.M.E.A. Council the Committee suggests that it is essential that a new Association should be formed to safeguard and promote the interests of the local authorities and the individual consumer. It is not considered that the Association of Municipal Corporations or any similar body is competent to protect the consumer, where technical advice is obviously essential. The scope of any new body should be wide enough to embrace local authorities which have no electricity undertakings. Reference is made to the possibility of the new Association's setting up the district committees which may be authorized by the Minister of Fuel and Power.

The Association might be controlled by a council constituted on similar lines to the Council of the I.M.E.A. and provision could be made by the Minister to pay the expenses of members and finance the new Association.

A suggested constitution is annexed to the memorandum. This provides for the representation in the Association of the British Electricity Authority (6 members), the Area Boards (42), the Consultative Councils (42) and District Committees (315), a total of 405 (105 District Committees are visualized). The general basis of representation allows for a third of the members to be engineer representatives.

ELECTRICITY SUPPLY

St. Helens Transmission Scheme.

School Lighting Improvements.

Bolton.—SODIUM AND INCANDESCENT LIGHTING.—The Corporation has recently introduced blended sodium lighting in some of the main thoroughfares. In Victoria Square sixteen Revo C.12122 fittings each with one 140-W Philips sodium lamp and two 150-W gas-filled lamps are installed, and in Newport Street eleven similar units each with one 140-W sodium and two 100-W gas-filled lamps, providing excellent visibility and evenness of illumination. The Revo unit has been specially produced for this scheme and is an open type fitting, comprising heavy weatherproof cast-iron canopy and frame, housing silvered mirror reflectors for the sodium lamp and white vitreous enamelled reflectors for the gas-filled lamps, which are situated at each end. Specially designed reflector panels are fitted in each side and opalescent panels in the ends. The Corporation Lighting Committee intends to complete the lighting of the town centre with similar equipment. Of the 144 units to be installed seventy-eight are already in use. Two bus stations in the town have also been lighted by Revo blended sodium equipment at the request of the Transport Department.

London.—INSTALLATION WORK.—The Education Committee of the London County Council has sanctioned the expenditure of £27,000 for the "electrification of gas-lit schools." The renewal of the fire alarm system and electric lighting in the nurses' home of the North-Western Hospital, Hampstead, at a cost of £2,500 has been approved by the Hospitals and Medical Services Committee, which has also sanctioned the continuance of the re-wiring of St. Andrew's Hospital, Bow, at a cost of £10,300 spread over three years. The Mental Hospitals Committee has authorized the re-wiring of ward blocks at St. Bernard's Hospital, Southall (£1,600); the installation of a call-bell system at Bexley Hospital (£1,500); and the removal of gas fittings and installation of electric lighting, etc., at Brunswick House, Mistley (£850).

Luton.—PURCHASE OF TRANSFORMERS. — To avoid delays the borough electrical engineer has been authorized to purchase in advance of requirements sixty transformers for use in connection with various projects envisaged in the area.

EXTENSIONS.—The Corporation is to supply electricity to cottages and a farm at Shillington (£594).

Middlesex.—SCHOOL LIGHTING.—Subject to the approval of the Ministry of Education the County Council is to improve the electrical installation at the Drayton Manor County School, Ealing, by the installation of 56 new lighting points, altering the positions of 99 existing points and providing 177 new lighting fittings, at an estimated cost of £720. It is proposed to install fluorescent lighting in the manual training and domestic subjects rooms for which the estimate is £350.

Mountain Ash.—ANOTHER "CHRISTMAS BOX."—Without a break since 1933 the U.D.C. Electricity Department has given its consumers a special "Christmas box," which has generally taken the form of a very low unit charge. This year, in announcing a further concession, Councillor E. Hamer said that it was probably the last that local consumers would enjoy as the undertaking would pass from the Council's control. Councillor Hamer paid a tribute to the electrical engineer, Mr. E. W. Jones, for the efficient manner in which the undertaking had been conducted. Consumers will benefit for £5,000 this year. For the Christmas quarter the first 100 kWh under the lighting flat rate will be charged at ½d. per kWh and all in excess at 1d. per kWh (no meter rent is payable). The running charge under the two-part tariff will be ½d.

Newcastle-under-Lyme.—REVIEW OF EXPENDITURE.—With regard to the Electricity Committee's application for sanction to borrow £55,500 for e.h.v. and l.v. mains extensions, new substation buildings, transformers and switchgear, the Electricity Commissioners have asked that the expenditure provided for in the application should be carefully reviewed with a view to postponing for the present those works not immediately required.

Reading.—STRENGTHENING OF RING MAIN.—The Electricity Committee recommends the strengthening of the 11-kV ring main system, involving the provision of new substations and feeder cables and additional equipment at the Hosier Street substation at an estimated cost of £50,444.

DUPLICATE SUPPLY.—The Corporation has received sanction to borrow £8,650 for a duplicate supply of electricity to the Northumberland Avenue substation.

St. Helens.—33-kV TRANSMISSION SCHEME.—Mr. P. Bregazzi, the borough electrical engineer, informs us that the Corporation has received sanction from the Electricity Commissioners to the borrowing of £286,708 to meet the cost of the first portion of a 33-kV transmission scheme. Work on the scheme is already in hand and it is expected that the first section will be completed in about two years.

St. Marylebone.—NEW SUBSTATIONS.—The Electricity Committee has approved expenditure amounting to £11,024 for equipment in connection with a proposed new substation to be erected at Chiltern Court. A substation is also

to be erected and equipped at Montague Square at an estimated cost of £27,791.

St. Pancras.—SUPPLIES TO HOUSING ESTATES.—The Electricity and Public Lighting Committee recommends the provision of a substation on the Oakley Square housing estate at an estimated cost of £8,040. In connection with this estate and at Peckwater Street, mains are to be laid at a cost of £7,148.

NEW FEEDER.—While work is in progress on laying a cable duct from the power station to Euston Road, the Committee proposes to replace the h.v. feeder to Midland Road (£2,153) in order to save further excavation later. It is also to lay an a.c. main in place of the existing d.c. cable along the same route (£3,750).

RATE CONTRIBUTION.—A sum of £15,244 is being allocated to the relief of the rates from the £22,735 profit on the past year's working of the electricity undertaking.

Scotland.—POWER PROJECTS CONFIRMED.—The North of Scotland Hydro-Electric Board's projects at Glen Lussa, Argyllshire (Constructional Scheme No. 8) and at Storr Lochs, Skye (Constructional Scheme No. 13) have been confirmed by the Rt. Hon. Arthur Woodburn, M.P., Secretary of State for Scotland.

Skipton.—INCREASE IN CHARGES SUSPENDED.—The Urban District Council is to suspend the 10 per cent increase in ordinary electricity charges for the December quarter. On the basis of the determination recently made by the Electricity Commissioners on the Ilkley Council's claim, Skipton expects a substantial return from the bulk suppliers of electricity on accounts dating back to 1939.

Stoke Newington.—CHANGE-OVER REPORTS.—The borough electrical engineer has presented a report upon the progress made during the summer with the change-over from d.c. to a.c. and has also prepared a scheme for further work in this connection. It is proposed that in the southern area, where there are 2,806 d.c. consumers, a total of £27,510 shall be expended on the necessary mains, meters, substation equipment and conversion of consumers' apparatus. For the northern area (1,475 consumers) work costing £18,880 is proposed. The Electricity Committee has recommended that the work shall be proceeded with. The Council has approved and the borough electrical engineer is being authorized to apply for the sanction of the Electricity Commissioners.

PURCHASE OF MOTORS.—In view of the long delivery periods now experienced in connection with motors needed for the change-over the engineer has been authorized to buy such quantities of the motors required as he is able to obtain.

Stretford.—BOARD'S ACCOUNTS.—The 1946-47 accounts of the Stretford and District Electricity Board (chief engineer and manager, Mr. H. G. Bell) show a net profit of £62,798, compared with £32,309 in 1945-46. This increase is accounted for by the fact that, because of increased wear and tear allowances on recent capital expenditure, there was no income tax liability last year (against £30,877 provided in 1945-46). The Board's tax liability has not been finally settled for any year since 1936-37, and benefit should be derived under a recent High Court ruling (if not reversed) regarding the operation of Section 15 of the Finance Act, 1937, it being held that certain buildings qualify for the exceptional depreciation allowance.

TRANSPORT

Glasgow.—ADDITIONAL GENERATING PLANT.—The Electricity Commissioners have sanctioned the installation of additional generating plant at the Transport Department's Pinkston power station, comprising one 30,000-kW turbo-alternator, two 175,000 lb boiler units, and a 3·5 million gal. per hr cooling tower.

Liverpool.—TRAM-SHED FIRE.—In a fire which destroyed the Corporation's Green Lane tram-shed the loss is estimated at more than £300,000. The sixty-nine trams destroyed will cost between £5,000 and £6,000 each to replace.

Traction Vehicles

Improved Performance

TO satisfy a demand for tramcars and railway coaches capable of a higher schedule of performance, quieter running, better track-riding and more passenger comfort, a new class of equipment is now available from the Traction Division of Crompton Parkinson, Ltd.

It comprises trucks of the P.C.C. type (the exclusive British licence has been acquired from the Transit Research Corporation, U.S.A.) together with "Vambac" control gear evolved by Crompton Parkinson, Ltd., as an improvement upon the P.C.C. developments in the United States.

Advantages claimed are higher acceleration, balancing speeds and braking rates; less noise and vibration, weight reduction, superior body and truck appearance, while first cost has been reduced by standardized design and improved production methods.

The minimum of modification is needed to render this equipment equally suitable for single-deck bogie cars operating singly or in multiple units, double-deck bogie cars and single-deck cars hauling trailers.

The truck (manufactured by Maley & Taunton, Ltd.) is available in several models, and is unorthodox in several features of design and construction. The control equipment (manufactured by Allen, West & Co., Ltd.) has been named "Vambac" to indicate variable automatic multi-notch braking and acceleration. It has already been applied to modified tramcars by the Transport Department of the Blackpool Corporation and incorporated in a new double-deck car by the Glasgow Corporation.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Radio & Television Trust, Ltd., has amplified the statement recently issued to shareholders. The Board states that the small size of the home quota and the closing of many overseas markets, has brought about the need considerably to reduce the manufacturing organization. Philco radio products (for the home market) will continue to be available through the Philco Radio & Television Corporation of Great Britain, Ltd., and Airmec receivers (for export) through Airmec International Sales, Ltd. Mr. J. V. Holman has been appointed managing director of both selling companies. The other subsidiary companies—Britannic Electric Cable & Construction Co., Ltd., British Mechanical Productions, Ltd., General Accessories Co., Ltd., and Hopkinson Electric Co., Ltd., are said to be progressing favourably.

The Oriental Telephone & Electric Co., Ltd., in a preliminary statement, shows a net revenue for 1946 of £53,627, against £20,547 for 1945. The increases includes profits from the Singapore undertaking for nine months to December 31st, 1946, and a dividend from the China & Japan Telephone & Electric Co. The net losses arising from the Japanese occupation of Singapore have been charged to capital reserve. The final dividend is 6 per cent, making 10 per cent, less tax, for the year (against 4 per cent). The balance carried forward is £73,070 (against £76,463 brought in).

The Kalgoorlie Electric Tramways, Ltd., reports a net profit (before interest on "B" debentures) of £3,513 (against £3,606), which is transferred to reserve for redemption of "B" debentures. In October £6,000 was paid to the trustees to enable them to make a further distribution on the "B" debentures of 6 per cent. The undertaking was transferred to a Board formed by local municipalities, etc., on March 31st last, and an extra-ordinary meeting will later be called to consider a resolution for the voluntary winding-up of the company. It is stated that the amount available when the assets are fully realized will be insufficient to meet all claims in respect of "B" debenture holders.

The Lincolnshire & Central Electric Supply Co., Ltd., reports a revenue for the year ended March 31st last of £82,862, as compared with £83,358 for the preceding year, and a profit of £54,403 (against £55,790). The ordinary dividend for the year is maintained at 9 per cent, reserve again receives £2,500 and £55,711 is carried forward (against £49,933 brought in).

Burco, Ltd., reports a trading profit for the year to September 30th of £115,852 (against £85,295 for 1945-46), to which is added £2,610 (£1,703) interest on investments. After providing £62,019 (£41,843) for taxation, £28,500 (£10,000) is allocated to general reserve and £2,000 to dividend equalization reserve (last year £9,300 to income tax reserve and £2,500 to special depreciation of plant). The dividend for the year is 35 per cent (against 20 per cent dividend and 15 per cent bonus) and £20,224 (£20,507) is carried forward.

Yarrow & Co., Ltd., in their accounts for the year ended June 30th last, show a net profit of £53,462 (against £56,569 for 1945-46) after providing £47,500 (£35,000) for taxation. A sum of £100,000 (nil) is being transferred to general reserve and, as last year, it is proposed to pay a dividend of 10 per cent and a cash bonus of 5 per cent, both tax free. This reduces the carry-forward from £105,191 to £36,153.

The Sun Electrical Co., Ltd., is to pay a dividend of 7½ per cent, 3 per cent more than last year. The net profit increased from £20,106 to £37,304.

The Chloride Electrical Storage Co., Ltd., is maintaining the interim dividend on the "A" and "B" ordinary at 5 per cent, less tax.

Johnson & Phillips, Ltd., have announced an interim dividend of 7½ per cent, the same as last year but on increased capital.

The Ebonite Container Co., Ltd., is again paying an interim dividend of 5 per cent.

New Companies

Rural Electrification Services, Ltd.—Registered November 4th. Capital, £5,000. Mechanical, electrical and agricultural engineers, manufacturers of, and dealers in, electric generating plant and machinery, particularly in relation to the use of machinery and appliances for the electrification of farms, etc. Directors: A. Monkhouse and T. J. Mansfield. Secretary: A. Monkhouse. Regd. office: 86, Temple Chambers, E.C.4.

Frigmatic, Ltd.—Registered November 5th. Capital, £10,000. To acquire from Sound, Ltd., and carry on part of the business of that company known as the refrigeration division carried on at Kelvinator House, 24, Charles Street, Cardiff. Permanent directors: A. Withers, A. J. Withers and F. A. Cam. Regd. office: Kelvinator House, 24, Charles Street, Cardiff.

Fluorel, Ltd.—Registered November 5th. Capital, £1,500. To acquire the business of fluorescent electrical fittings manufacturers, etc., carried on by B. G. Heath and A. S. J. Thomas at 159a and 159b, Midland Road, Leyton, E.10, as the Fluorescent Electrical Company. Directors: B. G. Heath and A. S. J. Thomas. Secretary: F. H. Eiles. Regd. office: 159a, Midland Road, Leyton, E.10.

Fortune (Sale), Ltd.—Registered November 5th. Capital, £1,000. Manufacturers and dealers in radio and television receivers and transmitters, etc. Directors: M. D. Fortune, G. D. Fortune and B. W. Fortune (secretary).

Robert Martine (Radio), Ltd.—Registered October 29th. Capital, £3,000. Manufacturers of, and dealers in, wireless and television sets and accessories, electrical appliances, etc. Directors: H. Kirk, A. Rayne, and R. M. Marshall. Regd. office: 126, Tottenham Court Road, W.C.

"S" Productions (Crouch End), Ltd.—Registered October 28th. Capital, £1,000. Manufacturers of, and dealers in, electrical appliances and apparatus. Subscribers: A. E. Morton and Joan E. M. Payne. Regd. office: 66, Crouch End Hill, Hornsey, N.8.

Winget-Syncro, Ltd. — Registered October 28th. Capital, £15,000. To adopt an agreement with the Syncro Machine Co., Inc., U.S.A. and Winget, Ltd., and to carry on the business of manufacturers and sellers of wire manufacturing equipment, including drawing, braiding and insulating machines and other such equipment. Directors: F. Johnson, C. B. Fantone, and R. Ducas, all of New York, G. Dickson, Darenth, nr. Dartford, Kent, and N. Staff, Strood, nr. Rochester. Regd. office: Rochester, Kent.

Refrigeration & Electrical Services (Birmingham), Ltd.—Private company. Registered October 28th. Capital, £3,000. Manufacturers, importers and exporters of, and dealers in, refrigerators and cold storage plant and machinery, electrical appliances, washing and mincing machines, vacuum cleaners, etc. Directors: W. A. Knee and L. G. Knee. Regd. office: National Provincial Bank Chambers, Five Ways, Birmingham, 15.

France (Seahouses), Ltd.—Registered October 18th. Capital, £1,000. To acquire the business of a radio and electrical engineer carried on by G. France at Main Street, Seahouses, Northumberland. Directors: G. France and Mrs. E. M. France. Regd. office: Main Street, Seahouses, Northumberland.

R. V. Baker, Ltd.—Registered October 17th. Capital, £1,500. Electrical engineers and general electrical installation contractors, wireless engineers, etc. R. V. Baker is permanent director. Regd. office: 66, The Strand, Cheltenham.

Senior Electronic Service, Ltd.—Registered October 27th. Capital, £2,000. To acquire the business of dealers in radio and electrical apparatus and fittings now carried on by T. P. Senior and J. R. Senior at 429, Staniforth Road, Sheffield, as "Senior Electronic Service." Permanent directors: T. P. Senior and J. R. Senior (directors of Percy Senior, Ltd.). Regd. office: 429, Staniforth Road, Sheffield.

Sunderland Electric Co., Ltd.—Registered October 27th. Capital, £3,000. Manufacturers and dealers in radio, television, electrical and other apparatus, etc. Directors: J. A. Trott and J. Hughes. Secretary: J. A. Trott. Regd. office: 26, Highgate Road, Birmingham, 12.

F. W. Thompson, Ltd.—Registered November 5th. Capital, £2,000. Electricians, electrical, radio and television engineers, etc. Directors: F. W. Thompson and J. H. Taylor. Regd. office: 170, Knighton Lane, Leicester.

Joslight Electrical Exports & Imports, Ltd.—Registered November 3rd. Capital, £500. Directors: H. W. Martin and R. G. E. Joslin. Regd. office: 243, Imperial Drive, Harrow, Middlesex.

Relder (Factors), Ltd.—Registered October 27th. Capital, £1,000. Manufacturers and dealers in electrical apparatus, radio and television equipment and products, etc. Directors: D. J. Lever and Mrs. L. P. Lever. Regd. office: 46, Curzon Street, Mayfair, W.1.

Refrigeration Engineers (Hants), Ltd.—Registered October 27th. Capital, £7,500. Refrigeration and cold storage engineers, etc. Directors: H. S. Beckett, Manor Farm, Brimington, Chesterfield, and R. Beckett.

Wirek (Electronics), Ltd.—Registered October 27th. Capital, £100. Manufacturers and dealers in recording and play-back devices and mechanisms, electrical, radio and recording engineers and contractors, etc. Directors: G. Hawkes, H. C. Westcott, and J. S. Little. Regd. office: 9-10, Dalston Gardens, Stanmore, Middlesex.

Liquidations

Phœnix Radio Manufacturing Co., Ltd.—Particulars of claims by November 30th to the liquidator, Mr. C. F. Carlisle, "Harrington House," Clarendon Street, Nottingham.

Glenmill Radio & Electrical Co., Ltd.—Particulars of claims by November 28th to the liquidator, Mr. W. Walker (Latham & Co.), 185-188, High Holborn, London, W.C.1.

Mayer & Co. (1932), Ltd.—Particulars of claims by December 12th to the liquidator, Mr. S. Chater (Poppleton & Appleby), 35, Windsor Place, Cardiff.

Crowne Electronic Engineering Laboratories, Ltd.—Winding up voluntarily. Liquidator, Mr. K. C. Robins, Lloyd's Bank Chambers, Penzance.

Bankruptcies

J. H. Christopher, 135, Balkwall Avenue, North Shields, lately carrying on business at 54, Saville Street and Suez Street, North Shields, electrical engineer.—Receiving order made November 4th on a creditor's petition.

P. Burns, 21, Pandora Road, Hampstead, London, electrician.—First meeting November 14th and public examination December 11th, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

STOCKS AND SHARES

NOW that the long anticipated Autumn Budget has at last been opened, Stock Exchange markets have a clearer perception of what lies in front of them. The uncertainty of the economic outlook, and the various phases of the crisis, which have proved such uncomfortable factors, are now to some extent alleviated, though by no means removed. In advance of the Budget, markets assumed a fairly bright appearance under the influence of cautious buying.

Both electricity supply and Home Railway stocks continue to be quoted substantially below the prices fixed, or estimated, as the basis for their eventual exchange into Government stock. Apprehension about a discount on the latter, when dealings begin, is an understandable reason for this state of affairs. Less apparent is the reason why, in relation to their compensation values, the electricity stocks should stand noticeably higher than do the railway issues. Buyers of the latter at present prices acquire the equivalent of the Government compensation stock at discounts up to as much as 8 per cent in the case of the junior issues. On the electricity shares, either ordinary or preference, the discount is seldom equal to much more than 4 per cent.

Millions of Money

It remains to be seen how the provisions of the new Budget will affect profits and dividends; there is likely to be a good deal of discrimination applied to industrial shares. But taken on the whole, investment—now able to see its way a little more clearly—can be expected to release the large sums of money which are known to be waiting for employment, and which will be reinforced by very substantial repayments, running into millions of pounds, due to take place in the near future. The rise in British Government issues led to sympathetic improvement in London Electric Transport 2½ per cent, a point higher at 96½. London Passenger Transport stocks are unchanged.

Changes on the Week

The modest volume of business transacted during the week preceding the Budget gave a healthy appearance to the industrial markets. A.E.I. led the way for electrical equipment shares with an advance of 2s. to 77s. Smaller gains were recorded by, amongst others, Telegraph Constructions 48s. 9d., G.E.C. 85s. 9d., Henley's 24s., Laurence Scott 11s. 6d. and English Electrics 53s. 3d. Tube Investments were outstanding with a rise from 5¾ to 6¾. Babcocks, 69s. 6d., British Aluminium, 46s. 9d., Murex, 88s. 9d., and De La Rue, 46s. 3d., all went better. Cossors revived to 19s. 9d. and Deccas to 32s. 6d., the latter being assisted by publication of the extensive list of Decca Navigator users. E. K. Coles, however, went back to 17s. Midland Electric were 5s. down at 8¼. Elsewhere, Atlas Electrics reacted to 14s.; Cable & Wireless stocks turned easier, and Telephone Rentals shed 6d. to 11s. Globe Telegraph ordinary at 43s. 6d. and the preference at 32s. have lost a few pence. Oriental Telephones rose a florin on the final dividend, making 10 per cent for the year.

E.M.I. Accounts

Electric & Musical Industries 10s. shares rose to 19s. before reacting to 18s. 3d. The full accounts favourably qualified the impression left upon the market a fortnight before by the smaller distribution and the preliminary figures. The latter disclosed little more than the drop in net profits, as compared with last year's, and the total tax payments. Involved in the net figures, it is now shown, are provisions and tax adjustments of considerable complexity. The market is inclined to pay more attention to the increase, to close upon £1 million, in the trading profit of the group as a whole, and reference by the chairman to steady expansion in the face of difficulties. Confidence in further progress is expressed in a yield of a modest £3 6s. 4d. per cent, on the 6 per cent dividend.

Crompton Parkinson Dividends

Autumn is apt to be a dull dividend season, apart from interim declarations by the majority of companies which end their financial years with the calendar; but several decisions of importance are due, before the end of the year, by the firms which make up their books to end-September. Crompton Parkinson is among them. The interim, paid in June, was maintained at 7½ per cent. A year ago, the final distribution of 15 per cent (including 7½ per cent bonus) was declared on the last day of November and paid a month later. The total of 22½ per cent was covered by earnings equal to 38 per cent on the £1,262,000 ordinary capital. The 5s. "A" shares, in which the market is freer than is the case with the ordinary, stand at 26s. on a £4 6s. 7d. per cent yield basis. They have touched extremes of 35s. 6d. and 22s. 6d. this year.

Miscellaneous Matters

Ever Ready 7 per cent participating preference shares, on offer at 50s., rank for an additional 3 per cent after 7 per cent has been paid on the ordinary. On the full 10 per cent, which has been paid for 20 years past, they pay 4 per cent on the money. Austin Motors' annual report refers to the progress with the Electric Vehicle Manufacturers subsidiary which is being developed in conjunction with Crompton Parkinson Ltd. Scophony 5s. shares have lost 6d. of their par value since the changes in the directorate. Radio & Television hardened to 4s. 6d. Calcutta Electrics have revived from their recent lowest ebb of 37s. 6d. to 52s. 6d., on the report of a decision by the local authority to exercise the option to purchase. Calcutta Trams are 2s. 6d. down at 37s. 6d.

Next Week's Events

Monday, November 17th

NOTTINGHAM.—Albert Hall, 6.30 p.m. I.E.E. East Midland Centre. Faraday Lecture. "Electricity and Everyman," by Dr. P. Dunsheath.

LIVERPOOL.—Reece's Restaurant, Parker Street. I.E.E. Mersey and North Wales Centre. Annual dinner and visit of President.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. Addresses by C. E. Strong and D. C. Gall (chairmen of the Radio and Measurements Sections).

CARDIFF.—South Wales Institute of Engineers, Park Place, 6.30 p.m. I.E.E. Western Transmission Group. "Economics of High Voltage Transmission by Underground Cables," by R. N. Berry.

LONDON.—At the Royal Society of Arts, John Adam Street, Adelphi, 6.30 p.m. Institution of Electronics. "Industrial Radiology," by R. H. Cooke.

LONDON.—St. Ermin's Hotel, S.W.1, 6 p.m. Association of Supervising Electrical Engineers (Central London District Branch). "Rotary and Static Single Phase to Three Phase Conversion," by A. N. D. Kerr.

BIRMINGHAM. — Grand Hotel, 6.30 p.m. Birmingham Electric Club. "Electricity in the Merchant Navy," by S. A. G. Emms.

Tuesday, November 18th

YORK.—Royal Station Hotel, 7 p.m. I.E.E. North Midland Centre. "Comparisons between Gas and Electricity on the Basis of Coal Economy," by P. Schiller. The meeting will be preceded by a visit to the works of Rowntrees, Ltd., in the afternoon and tea at the Royal Station Hotel.

BIRMINGHAM.—Midland Institute, 6.15 p.m. I.E.E. South Midland Centre. Faraday Lecture by Dr. P. Dunsheath.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Students' Section. "High Frequency Telephone Cables," by A. C. Holmes.

LONDON.—Magnet House, Kingsway, W.C.2, 6.15 p.m. Association of Supervising Electrical Engineers. "Electronics—a Brief Survey Followed by a Description and Demonstration of Some Electronic Instruments," by F. R. Unwin and A. W. Corneck. (Joint meeting with Institution of Engineers-in-Charge.)

Wednesday, November 19th

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "The Cavity Magnetron," by Dr. H. A. H. Boot and Prof. J. T. Randall; "The High-Power Pulsed Magnetron, Development and Design for Radar Applications," by W. E. Willshaw, L. Rushforth, A. G. Stainsby, R. Latham, A. W. Balls and A. H. King; and "The High-Power Pulsed Magnetron: a Review of Early Developments," by E. C. S. Megaw.

LONDON.—I.E.E. London Students' Section, 7 p.m. Visit to Central Control Room of C.E.B. (Repeat visit.)

LONDON.—John Adam Street, Adelphi, W.C.2, 2.30 p.m. Royal Society of Arts. "The Development of Sound Recording and Reproduction," by Sir Ernest Fisk.

BARNSLEY.—Town Hall, 7 p.m. I.E.E. Sheffield Sub-Centre. "Commercial Development of Electricity Supply as a Consumer Service," by C. T. Melling.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. Informal lecture on "Trends in Television Receiver Design," by Dr. N. H. Searby.

Thursday, November 20th

LONDON.—Savoy Place, W.C.2, 5.30 p.m. Institution of Electrical Engineers. Report on "The Practical Training of Professional Electrical Engineers," to be presented by Sir Arthur Fleming (chairman of the Joint Committee on Practical Training in the Electrical Industry.)

HASLEMERE.—At the Admiralty Signal Establishment, 5.45 p.m. I.E.E. Southern Centre. "The Design of High-Fidelity Disc Recording Equipment," by H. Davies.

SWANSEA.—The Guildhall, 6 p.m. I.E.E. West Wales (Swansea) Sub-Centre. Address by J. B. Gwynne Lewis, chairman of the Western Centre.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Record of Experience on the Irish Electricity Supply System," by A. Burke, R. C. Cuffe and W. O'Neill.

Friday, November 21st

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "Iron-Loss Measurement by A.C. Bridge and Calorimeter," by Prof. J. Greig and H. Kayser.

LONDON.—39, Victoria Street, S.W.1, 6.30 p.m. Junior Institution of Engineers. "Patents from the Layman's Point of View," by L. H. A. Carr.

NEWCASTLE-ON-TYNE.—King's College, 6.30 p.m. I.E.E. North-Eastern Students' Section. "Transients in Transmission Lines," by T. W. McLean.

SALFORD.—I.E.E. North-Western Students' Section, 7 p.m. Visit to Telephone House, Chapel Street.

New I.E.E. Group

The Council of the Institution of Electrical Engineers has given authority for the formation of an Installations and Transmission Group in the area of the South Midland Centre. The chairman is Mr. D. P. Sayers and the hon. secretary Mr. J. R. Anderson. Over 300 members have joined the group.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office,* 25, *Southampton Buildings, London, W.C.*2.

1943

DECCA Radio & Television, Ltd., and W. J. O'Brien —" Radio direction finders." 7670. May 13th, 1943. (593568.)

1944

Sperry Gyroscope Co., Inc.—" Ultra-high-frequency discriminator apparatus." 1682. February 1st, 1943. (593573.)

Westinghouse Electric International Co.—" Electric circuit interrupters having arc-extinguishing arrangements." 7725. March 19th, 1942. (593575.)

British Thomson-Houston Co., Ltd. (General Electric Co.).—" Electrical discharge devices." 8307. May 2nd, 1944. (593681.)

G. H. Collins and H. F. Collins.—" Electric immersion heaters." 8501. May 5th, 1944. (593741.)

Standard Telephones & Cables, Ltd.—" Receivers for pulse communication systems." 8847. July 3rd, 1942. (593731.) " Telecommunication switching systems." 14671. August 28th, 1943. (593687.)

International Business Machines Corporation.—" Electronic switching devices." 9409. May 23rd, 1941. (593577.)

National Cash Register Co.—" Electron discharge devices." 9737. March 28th, 1941. (593684.)

T.H. Noll.—" Electrical resistance alloys." 17041. September 6th, 1944. (593690.)

Amalgamated Wireless (Australasia), Ltd.—" Adcock direction finding systems." 18083. November 12th, 1943. (593798.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—" Arrangements for shaping and detecting electric pulses." 20400. October 20th, 1944. (593694.)

A. C. Wickman, Ltd., and R. G. Moffatt.—" Current and/or voltage regulators." 23126. November 21st, 1944. (593698.)

Marconi's Wireless Telegraph Co., Ltd.—" Electrical condensers." 17351. September 10th, 1943. (593749.) " Wide-band high-frequency transformers." 23872. June 4th, 1943. (593754.)

1945

Arc Electronics, Ltd., L. C. Welch and R. J. Cook.—" Electrical circuit arrangement for controlling alternating currents." 472 January 5th, 1945. (593755.)

Thorn Electrical Industries, Ltd., and R. L. M. Tye —" Tubular electric discharge lamp fittings." 542. January 5th, 1945. (593805.)

Radio Corporation of America.—" Dehydration of fluid materials by high-frequency electric fields." 1592. January 31st, 1944. (593806.) " Treatment of materials in high-frequency electric fields." 10659. April 27th, 1944. (593815.)

Allmanna Svenska Elektriska Aktiebolaget.—" Selenium rectifier element and method of manufacturing same." 3429. March 4th, 1944. (593808.)

Metropolitan-Vickers Electrical Co., Ltd., and C. R. Burch.—" Formation of curved surfaces of prescribed figure by grinding and/or polishing." 6866. March 19th, 1945. (593759.)

General Electric Co., Ltd., R. L. Breadner, H. G. Jenkins and C. H. Simms.—" Electric discharge lamps." 7158. March 21st, 1945. (593760.)

Titeflex, Inc.—" Locking, conducting, and sealing gasket for the connection of a spark plug lead with the manifold of a radio shielded ignition harness." 7727. February 25th, 1944. (593811.)

General Electric Co., Ltd., R. L. Breadner and C. H. Simms.—" Methods for producing articles including shaped glass parts." 8838. April 10th, 1945. (593712.)

Igranic Electric Co., Ltd., and J. A. Field.—" Electrical apparatus for energizing a load circuit for a timed period." 9690. April 18th, 1945. (593587.)

Woods of Colchester, Ltd., and B. B. Daly.—" Capacitor motors." 10394. April 25th, 1945. (593761.)

Macfarlane Engineering Co. Ltd., J. C. Macfarlane and W. I. Macfarlane.—" Dynamo electric machines." 11224. May 3rd, 1945. (593817.)

C. A. Steen.—" Electric steam boilers." 12228. May 15th, 1945. (593718.)

Railway Refrigeration Corporation.—" Cooling or refrigerating systems." 12621. May 18th, 1944. (593819.)

Autopulse Corporation.—" Electro-magnetic motors." 12636. October 30th, 1944. (593590.)

S. A. Pollock.—" Electric storage batteries and a method and apparatus for the manufacture thereof." 12711. May 22nd, 1945. (593719.)

British Thomson-Houston Co., Ltd.—" Magnetic wedges particularly suitable for dynamo-electric machines." 14493. June 10th, 1944. (593600.) " Electrical switches and contacts therefor." 14706. June 12th, 1944. (593615.) " Moulded fibre products." 14834. June 14th, 1944. (593625.) " Methods of measuring frequency differences." 15210. June 17th, 1944. (593636.) " Fuse devices." 16355.

June 29th, 1944. (593784.) "Methods of rendering materials water repellent." 16511. July 1st, 1944. (593727.)

British Thomson-Houston Co., Ltd., and J. Moir.—"Remote control systems." 14495. June 8th, 1945. (593601.) "Circuit arrangements for amplifying electric oscillations." 14835. June 12th, 1945. (593771.)

L. Dodeux.—"Push-button electric switches." 14504. May 8th, 1944. (593603.)

W. J. Frame.—"Suction cleaners." 14508. June 8th, 1945. (593623.)

H. Frost & Co., Ltd., and A. W. Moss.—"Electric fans." 14510. June 8th, 1945. (593604.)

Sulzer Frères Soc. Anon.—"Turbo-machines." 14874. July 5th, 1944. (593774.)

G. D. Olsson.—"Push-button switches." 14925. July 11th, 1944. (Cognate application 14926/45.) (593725.)

Automatic Telephone & Electric Co., Ltd., and G. T. Baker.—"Electrically operated timing arrangements." 14947. June 13th, 1945. (Cognate application 17527/45.) (593619.) "Electrical signalling systems and apparatus for use therein." 14948. June 13th, 1945. (593779.)

W. Jones.—"Construction of lantern body for enclosing an electric lamp." 14971. June 13th, 1945. (593783.)

English Electric Co., Ltd., and N. H. Shaw.—"Operation of self-excited d.c. generators." 14993. June 13th, 1945. (593627.)

General Electric Co., Ltd., and J. Cates.—"Circuits for electric discharge lamps." 15010. June 13th, 1945. (593825.)

Marconi's Wireless Telegraph Co., Ltd., and J. D. Brailsford.—"Compensating arrangements for electrical circuits involving inductance." 15144. June 14th, 1945. (593632.)

Revo Electric Co., Ltd., A. E. Felton and A. N. Harding.—"Electric hot-plates and the like." 15204. June 15th, 1945. (593635.)

Milnes Electrical Engineering Co. (Bingley), Ltd., and H. R. Milnes.—"Nickel-iron and nickel-cadmium electric batteries." 15390. June 18th, 1945. (Cognate applications 15391/45 and 32459/45.) (593643.)

A. B. Dumont Laboratories, Inc.—"Voltage gain control devices." 15438. June 17th, 1944. (593646.)

British Broadcasting Corporation and H. Davies.—"Sound recording apparatus." 15481. June 18th, 1945. (593654.)

British Electric Meters, Ltd., and N. B. Coop.—"Electric switches for coin freed mechanism." 15885. June 21st, 1945. (593671.)

Western Electric Co., Inc.—"Electron discharge apparatus." 15973. June 29th, 1944. (593674.)

1946

National Cash Register Co.—"Apparatus for generating electrical impulses." 31414. March 20th, 1940. (Divided out of 593682.) (593728.)

Trade Marks

THE following applications have been made for trade marks. Objections may be entered within a month from November 5th:—

ELEKTRO-HELIOS. No. B648,338, Class 6. Electric washing machines, vulcanizing apparatus and electrically-heated mangles. Also No. B648,341, Class 11. Installations, apparatus and appliances, all employing an electric heating element, for heating, cooking, drying, ventilating, etc., and parts, included in Class 11 of all such goods, but not including electric fires and radiators or similar goods. Elektriska Aktiebolaget Helios, Heliosvagen 12, Stockholm 20, Sweden. Address for service: c/o J. Y. & G. W. Johnson, 47, Lincoln's Inn Fields, London, W.C.2.

SILVEX. No. 641,422, Class 9. Electric conduits and fittings therefor and electrical switchgear for industrial purposes. Also No. 650,708, Class 11. Electric lighting fittings. Simplex Electric Co., Ltd., Broadwell Road, Oldbury, near Birmingham.

INSEC. No. 647,964, Class 9. Electric soldering tools. Banks (London), Ltd., 111, Clapham High Street, London, S.W.4.

POLYTRON. No. 650,186, Class 9. Electrical apparatus and instruments included in Class 9, etc. R. Moller and Margaret L. Moller, 100, Castelnau, London, S.W.13.

FLUOTROL. No. 651,824, Class 9. Chokes, choking coils, condensers, switches, transformers, conductors and terminals, and insulated electric wire. F. C. Heayberd & Co., Ltd., 28, Russell Square, London, W.C.1.

UNIRAD. No. 651,835, Class 9. Electrical instruments and apparatus, etc., included in Class 9, and parts and fittings for all such goods included in Class 9; but not including wireless telephonic and telegraphic receiving and transmitting apparatus and parts thereof. Union Radio Co., Ltd., U.R. Works, Aurelia Road, Croydon, Surrey.

CORONA and NORVIC. Nos. 649,258/9 respectively, Class 10. Electrically heated pads for surgical and curative purposes, electrically heated blankets and bedwarmers. Denhams (Norwich), Ltd., Woodhouse Road, Todmorden, Lancs.

Design. No. B649,645, Class 11. Cooking apparatus. Benham & Sons, Ltd., 66, Wigmore Street, London, W.1.

OCEAN. No. 650,998, Class 11. Installations for lighting, heating, steam generating, cooking, refrigerating, drying and ventilating. Ocean Home Appliances, Ltd., 99a, Park Lane, London, W.1.

QUIZ. No. 652,087, Class 11. Electric light holders. F. Summerland, 22, Ainsdale Road, Western Park, Leicester.

OPTIDYNE. No. 647,521, Class 12. Electric motors, starting devices, etc., for land vehicles. Dynoworks, Ltd., 89, Woodstock Road, Oxford.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Edinburgh.—November 21st. City Council. Electric passenger/goods lift at Portobello power station. (October 31st.)

December 19th. City Council. Meters for twelve months to May 28th, 1949. (See this issue.)

Heston and Isleworth.—December 6th. Electricity Department. Underground cables, straight-through joints and three-panel switchboard. (See this issue.)

Kettering.—December 3rd. Electricity Department. Five-panel, 11,000-V, three-phase, 150,000-kVA duplicate busbar, hand-operated, metalclad switchgear. (See this issue.)

Leeds.—December 3rd. Transport Committee. Electrically-operated engine testing dynamometer plant, suitable for omnibus engines. (November 7th.)

London.—Ministry of Works. Canteen equipment, including electric fish fryers and mixing machines. Firms wishing to tender should write to Contracts 8, Ministry of Works, Dean Bradley House, Horseferry Road, London, S.W.1.

Plymouth.—December 20th. Electricity Department. Six circulating water pumps and motors. (See this issue.)

Risca (Mon.).—December 6th. Electricity Department. Oil-cooled static transformers, l.v. switchgear, substation kiosk and l.v. cable. (See this issue.)

Wallasey.—November 27th. Corporation. 33-kV and pilot cable. (See this issue.)

Woolwich.—December 1st. Electricity Department. H.v. and m.v. cables, transformers and meters for the year ending December 31st, 1948. (October 31st.)

Orders Placed

Burnley. — Corporation. Recommended. Electric lighting installation at St. Mary's R.C. School (£636).—F. Walker.

Glasgow.—Accepted. Boiler feed pumps, including automatic starting equipment, for new generating station (£40,331).—Harland & Wolff. 132-kV switchgear and accessories (£186,025).—A. Reyrolle & Co. Steel frame for turbine house and boiler house (£472,838).—Sir William Arrol & Co.

Islington.—Borough Council. Accepted. 200 transformers (approximately £47,000).—British Electric Transformer Co.

Luton. — Corporation. Accepted. 22-kV switchboard and control panel, Sundon substation (£28,032).—A. Reyrolle & Co.

Northumberland. — Education Committee. Accepted. Electrical installation at Gosforth West Primary School (£2,774) and similar work at Bellingham Modern School (£2,463).—Falconar, Cross & Co. Electrical installation at Monkseaton Primary School (£1,243).—Devereux, Moodie & Co.

County Council. Accepted. X-ray equipment for Blyth tuberculosis dispensary (£1,919).—Watson & Sons.

Reading.—Electricity Committee. Recommended. Transformers (£5,045).—Ferranti.

Southport.—Corporation. E.h.v. switchgear for two years from October 1st, 1947.—Ferguson, Pailin. Cables for twelve months from October 1st.—B.I. Callender's; Edison Swan Cables. Transformers for twelve months.—Electric Construction Co.

Stoke Newington.—Electricity Committee. Accepted. Four-panel 11-kV, 150-MVA rupturing capacity switchboard and associated equipment (£1,810).—Reyrolle. Nine-panel l.v. distributing board (£650).—English Electric.

Workington. — Recommended. Four l.v. switches (£868).—Switchgear & Cowans. H.v. panel for Salterbeck substation (£494).—Brush Electrical Engineering Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Houses (40), Ash; borough surveyor, municipal buildings.

Alloa.—Offices, Park Place; Ministry of National Insurance.

Altrincham.—New works off Davenport Road; Pultra, Ltd., 2, Dawson Road, Broadheath.

Bath.—Rebuilding parochial school, Twerton, as County Council school (£52,000); city architect, Guildhall.

Blyth.—Clothing, bedding and mineral water factories on the North Farm trading estate for North-Eastern Trading Estates, Ltd., Low Fell, Gateshead.

Brynmawr.—Factory for Leathercraft of Malvern, Ltd., Worcester Road; Sir Alexander Gibb & Partners, Queen Anne's Lodge, S.W.1.

Burnley.—Crematorium; A. G. Richardson, borough engineer.

Cardiff.—Factory, Penarth Road, Savoy Watch Co., Ltd.; Percy Thomas & Son, 10, Cathedral Road.

Carlisle.—Extensions to works, for Metal Box Co., Ltd., James Street; S. N. Cooke & Partners, Sun Buildings, Bennetts Hill, Birmingham.

Chadwell Heath.—New works for Lewis Berger, Ltd., paint manufacturers, Homerton, E.9; C. W. Glover & Partners, 54, Victoria Street, S.W.1.

Chelsea.—Extension to nurses' home at Brompton Hospital, Fulham Road; Saxon Snell & Phillips, architects, 9, Bentinck Street, London, W.1.

Cumberland.—First part of scheme for new secondary school at Wigton for the C.C.; county architect, 4, Alfred Street North, Carlisle.

Darlington.—Houses (31), Carmel Road, for the North-Eastern Housing Association; G. M. Pearson, builder, Hetton, Co. Durham.

Durham.—Police houses (500) in various parts of the county; county architect, Shire Hall, Durham.

Gateshead.—Extensions to works; Redheugh Iron & Steel Co.

Glasgow.—New engineering block for Royal Technical College; the Principal.

Factory buildings at Thornliebank; manager, Scottish Industrial Estates, Ltd., 3, Woodside Place, C.3.

Haltwhistle.—Extensions to works, Kilfrost, Ltd.; Cackett, Burns Dick & MacKellar, 21, Ellison Place, Newcastle-on-Tyne.

Hammersmith.—Development of Riverside Studios, including three-storey building adjacent to Crisp Road; C. Edmund Wilford, architect, 109, Jermyn Street, S.W.1.

Ilford.—Factory, junction of Khartoum Road and Ilford Lane; David Dowling & Co., Ltd., Khartoum Road.

Jarrow.—Factory, Bede Estate, for H. Mullins (Earby), Ltd.; G. Henderson, builder, East Boldon.

Lampeter.—New secondary school for C.C.; Rhys Jones, county architect, County Offices, Aberayron, Card.

Lichfield.—Workshops, offices, power house, etc., off City Station Wharf; Blewitt & Sons, Stowe Street.

Liverpool.—Laboratories at Walton Technical Institute, Fountains Road; director of housing, Blackburn Chambers, Dale Street, Kingsway.

Mansfield.—Garage for Trent Motor Traction Co., Ltd., Uttoxeter New Road, Derby.

Middlesbrough. — Temporary R.C. church (£8,000); T. Crawford, architect, 82, Borough Road.

Newburn-on-Tyne.—Factory for G. Angus & Co., Newcastle; S. Milburn & Partners, Y.M.C.A. Buildings, Fawcett Street, Sunderland.

Newport (Mon.).—Laboratories, offices, etc.; Monsanto Chemicals, Ltd., Victoria Station House, London, S.W.1.

Northumberland.—Pithead baths at the Bates Pit, Blyth, for the Miners' Welfare Commission.

Norwich.—Primary school, Horns Lane; Llewellyn & Sons, builders, 49, Queen Victoria Street, E.C.4.

Perivale.—Additions to works; Hoover, Ltd., Western Avenue.

Perth.—Agricultural houses (100); county architect, County Offices, York Place.

Ramsgate.—New casualty and out-patients' department at the General Hospital; W. W. Martin, builder, Dane Park Road.

Rawmarsh.—County primary school, Monkwood estate; West Riding county architect, Wakefield.

Ross-on-Wye. — New nurses' home, Gloucester Road, for Hospital Committee; G. E. Hardy, architect, Woodside.

Skelton (Cumberland).—Buildings, for the B.B.C.; John Laing & Son, Ltd., builders, Carlisle.

Tynemouth.—Mineral water factory, North Shields; W. Stockdale, architect, Howard Street, North Shields.

Wallsend-on-Tyne.—Factories on the trading estate; Henderson Bros., Smith Street, Tyne Dock, South Shields.

Walsall.—Additions to Beacon Lodge Hospital; M. E. Habershon, borough engineer, The Council House.

West Bromwich.—Factory premises, West Walsall Road, for Woodward Products, Ltd.; W. C. Ashton Randle, 77, Stanley Road, Stone Cross, Staffs.

West Hartlepool.—Garage, workshops, showrooms and offices, York Road and Park Road; Ewart Parsons, Ltd., Park Road.

Westminster.—Rebuilding at Westminster School, Deans Yard; A. L. N. Russell, 13, Motcomb Street, S.W.1.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"GROVE" electric cooker.

"CLENAGLASS" electric washing machine.

"AVRO" electric fan heater.